University of Maryland

Volume I of III

RFI Addendum Report for the Paint Branch Road Landfill Areas and the Metzerott Road Landfill RCRA Corrective Action Permit MDD 980829873 College Park, Maryland

8 June 2000

Revised 6 April 2001

M6106.00.01

Environmental Resources Management

2666 Riva Road, Suite 200 Annapolis, Maryland 21401



TABLE OF CONTENTS

VOLUME I OF III

1.0	INTRODUCTION			1	
	1.1	PROJE	CT OBJECTIVE	1	
	1.2	BACKG	GROUND AND SIGNIFICANT CORRESPONDENCE	1	
	1.3	REPOR	RT PURPOSE	3	
2.0	RFI ADDENDUM METHODS				
	2.1	INSTAI	LLATION OF REPLACEMENT WELLS PW-1R AND PW-12R	4	
	2.2	GROUN	ND WATER SAMPLING	4	
		2.2.1	April 1999 Ground Water Sampling Event	4	
		2.2.2	March 2000 Ground Water Sampling Event	5	
	2.3	SOUNI	DING OF MONITORING WELLS	6	
	2.4	HEADS	SPACE MEASUREMENTS FOR POTENTIAL		
		ORGA	NIC VAPORS AT THE MONITORING WELLS	6	
3.0	RFI ADDENDUM RESULTS AND DISCUSSION				
	<i>3.1</i>	PAINT BRANCH LANDFILL AREAS		7	
		3.1.1	Ground Water Flow	7	
		3.1.2	Ground Water Quality	7	
	3.2	2 METZEROTT ROAD LANDFILL		13	
		3.2.1	Ground Water Flow	13	
		3.2.2	Ground Water Quality	14	
4.0	FATE AND TRANSPORT				
	4.1	METALS		18	
	4.2	DIOXI	N	19	
	4.3	METHANE		21	

TABLE OF CONTENTS VOLUME I OF III (CONTINUED)

5.0	QUA	LITATIVE RISK ASSESSMENT	23
	5.1	GROUND WATER	23
	5.2	SURFACE WATER	23
	5.3	SOILS	24
	5.4	SOIL TO GROUND WATER PATHWAY	24
	5.5	VAPORS	25
	5.6	ECOLOGICAL RECEPTORS	25
	5.7	SUMMARY	26
6.0	CON	ICLUSIONS AND RECOMMENDATIONS	27

TABLE OF CONTENTS VOLUME I OF III (CONTINUED)

LIST OF TABLES

TABLE 1	GROUND WATER MONITORING WELL DETAILS AND GROUND WATER ELEVATIONS
TABLE 2	SUMMARY OF GROUND WATER SAMPLES AND ANALYSES
TABLE 3	GROUND WATER RESULTS FOR METALS, PCBS, METHANE AND TSS, PAINT BRANCH LANDFILL AREAS
TABLE 4	SUMMARY OF THE GROUND WATER DIOXIN RESULTS FOR THE PAINT BRANCH LANDFILL AREAS
TABLE 5	AND THE METZEROTT ROAD LANDFILL SUMMARY OF TEOS FOR PAINT BRANCH
171000	LANDFILL AREAS AND THE METZEROTT ROAD LANDFILL
TABLE 6	MONITORING WELL HEADSPACE MEASUREMENTS ON 7 MARCH 2000
TABLE 7	GROUND WATER TEMPERATURE AND PH MEASUREMENTS AT PW-12R ON 16 MARCH 2000
TABLE 8	GROUND WATER RESULTS FOR METALS, PCBS, METHANE AND TSS, METZEROTT ROAD LANDFILL
TABLE 9	CALCULATED DILUTION FACTORS FOR PAINT BRANCH

TABLE OF CONTENTS VOLUME I OF III (CONTINUED)

LIST OF FIGURES

FIGURE 1	SITE LOCATION MAP
FIGURE 2	PAINT BRANCH LANDFILL AREAS GROUND WATER ELEVATION CONTOUR MAP, 19 APRIL 1999
FIGURE 3	METZEROTT ROAD LANDFILL GROUND WATER ELEVATION CONTOUR MAP, 19 APRIL 1999
FIGURE 4	RECHARGE AREA FOR PAINT BRANCH CREEK
FIGURE 5	RECHARGE AREAS AND MODELED CROSS-SECTIONAL LENGTHS USED FOR GROUND WATER DISCHARGE FROM THE LANDFILLS

TABLE OF CONTENTS (CONTINUED)

VOLUMES II AND III OF III

LIST OF APPENDICES

APPENDIX A	CORRESPONDENCE WITH EPA
APPENDIX B	MONITORING WELL CONSTRUCTION DETAILS FOR PW-1R AND PW-12R
APPENDIX C	COPIES OF ERM'S FIELD NOTES FOR THE MARCH 2000 GROUND WATER SAMPLING EVENT
APPENDIX D	QUALITY ASSURANCE REPORT FOR THE APRIL 1999 GROUND WATER SAMPLING EVENT; LABORATORY DELIVERABLES; PERFORMANCE EVALUATION SAMPLE RESULTS
APPENDIX E	QUALITY ASSURANCE MEMORANDUM FOR THE MARCH 2000 GROUND WATER DIOXIN RESULTS; LABORATORY DELIVERABLES
APPENDIX F	METHANE MONITORING PLAN PREPARED BY THE UNIVERSITY OF MARYLAND DEPARTMENT OF ENVIRONMENTAL SAFETY

1.0 INTRODUCTION

The University of Maryland (UM) is currently conducting Resource Conservation and Recovery Act (RCRA) corrective action activities at its College Park, Prince Georges County, Maryland facility. On behalf of UM, Environmental Resources Management, Inc. (ERM) has prepared this report to summarize the results of the RCRA Facility Investigation (RFI) Addendum performed for the Paint Branch Landfill Areas and the Metzerott Road Landfill (Metzerott Landfill). This work was performed under RCRA Corrective Action Permit MDD980829873 (Permit).

This report is a final revision of an earlier report submitted to the United States Environmental Protection Agency (EPA) in June 2000ⁱ. ERM has revised the report to address EPA's comments to the June 2000 report, as articulated in EPA's letter to UM dated 13 February 2001. A copy of EPA's comments are found in Appendix A. Note that EPA approved ERM's request on 28 February 2001 that the appendices included with the 8 June 2000 RFI Addendum Report not be duplicated for this revised report. Rather, only the additions to appendices are attached herein for the recipient to incorporate with the original document.

1.1 PROJECT OBJECTIVE

The objective of the RFI Addendum was to assess whether the Paint Branch Landfill Areas and Metzerott Landfill released Permit-list metals to ground water. As requested by EPA during a meeting with UM and ERM on 1 October 1997, the RFI Addendum also included ground water samples for polychlorinated biphenyls (PCBs), polychlorinated dibenzo(p)dioxins (dioxins), and methane.

1.2 BACKGROUND AND SIGNIFICANT CORRESPONDENCE

Under the Permit, the three closed landfill areas at Paint Branch were designated as Solid Waste Management Units (SWMUs) 9, 10, and 11. The Metzerott Landfill was designated as SWMU 12. Figure 1 shows the general locations of these SWMUs.

ERM 1 UM/M6106.00.01-04/06/01

¹ RFI Addendum Report for the Paint Branch Road Landfill Areas and Metzerott Road Landfill, RCRA Corrective Action Permit MDD 980829873, College Park, Maryland, 8 June 2000. Prepared for UM by ERM.

The landfills were used by UM from the 1940s to the 1960s for the disposal of trash, construction and demolition (C&D) debris, and fly ash from the facility's coal-fired steam plant. The landfills are closed and covered by vegetated cover soils, pavement, or buildings for beneficial use by UM. Walkovers of the landfills by UM and ERM indicate that the underlying materials are not exposed at the ground surface.

A well search using a database maintained by the Maryland Department of the Environment (MDE) showed that ground water is not used for potable water at or within a one mile radius of the Paint Branch Landfill Areas or Metzerott Landfill (Figure 1). In addition, the Prince Georges County 10-year water and sewer plan shows that municipal water is available within this area of College Park. Consequently, Prince Georges County imposes a general prohibition on ground water use for areas serviced by the municipality, which virtually eliminates the potential for future ground water use in the area.

UM retained R&R International, Inc. (R&R) to implement the EPA-approved RFI planⁱⁱ for these landfills. As documented in R&R's August 1996 reportⁱⁱⁱ, which was approved by EPA's letter dated 11 February 1997, the RFI results for sediments, surface water and soil samples from Paint Branch and its tributary at Metzerott Landfill did not indicate any release of Permit-list metals, volatile organic compounds (VOCs) or semivolatile organic compounds (SVOCs). The RFI results for ground water samples from the landfills also did not indicate any release of Permit-list VOCs or SVOCs at concentrations of concern. R&R reported Permit-list metals in the ground water.

Subsequent to EPA's approval of R&R's 6 August 1996 RFI report, UM retained ERM for independent review of the report and its findings. ERM concurred with the RFI results for sediments, surface water and soil samples, as well as the VOC and SVOC results for ground water. However, UM and ERM determined that the ground water sampling and analytical procedures used for Permit-list metals caused the results to be suspect and biased high.

EPA agreed with ERM that the R&R ground water results for Permit-list metals were not representative of the ground water conditions at the landfills. EPA also agreed that re-sampling of the ground water monitoring wells using appropriate sampling methods for Permit-list metals was warranted. EPA agreed with ERM's

[&]quot;Prepared by Buchart-Horn in 1992-1993.

iii RCRA Facility Investigation Report 6 August 1996. Prepared by R&R International, Inc. for UM.

findings and recommendations at a meeting on 1 October 1997, which was documented in UM's letter to EPA dated 13 October 1997.

On 10 April 1998, ERM submitted to EPA a RFI Plan Addendum for the Paint Branch Landfill Areas and Metzerott Landfill (RFI Plan Addendum). The RFI Plan Addendum described the means and methods to implement the course of action agreed upon by EPA and UM. By its letter dated 29 October 1998, the EPA provided UM with comments on the RFI Plan Addendum. ERM addressed EPA's comments, and submitted a revised RFI Plan Addendum to the EPA dated 16 February 1999. By its letter dated 3 March 1999, EPA approved the revised RFI Plan Addendum.

From April to early August 1999, ERM implemented the EPA-approved RFI Plan Addendum. On 3 August 1999, ERM submitted to EPA an Interim RFI Addendum Report for the Paint Branch Landfill Areas and Metzerott Landfill (Interim RFI Addendum Report), which summarized the project findings at that time. EPA provided comments to UM on the Interim RFI Addendum Report by letter dated 21 October 1999.

By letter dated 12 November 2000, ERM responded to EPA's comments on the Interim RFI Addendum Report. EPA's letter dated 1 February 2000 provided UM with written approval of ERM's responses to EPA's comments. As a result, additional field activities, and certain revisions to the Interim RFI Addendum Report were agreed upon by EPA and UM. Appendix A contains copies of EPA's letters dated 21 October 1999 and 1 February 2000, and ERM's letter dated 12 November 1999.

ERM submitted the RFI Addendum Report to the EPA in June 2000. In response, the EPA provided its comments to UM by letter dated 13 February 2001 (an addition to Appendix A).

1.3 REPORT PURPOSE

The purpose of this RFI Addendum Report is to summarize the project findings, and to recommend an appropriate course of action consistent with EPA's comments articulated in its 13 February 2001 letter. This report integrates the results previously presented in the 3 August 1999 Interim RFI Addendum Report with the findings associated with the additional field work and report revisions required by the EPA in its letters dated 21 October 1999 and 1 February 2000. This RFI Addendum Report supercedes the 3 August 1999 Interim RFI Addendum Report and 8 June 2000 RFI Addendum Report.

2.0 RFI ADDENDUM METHODS

2.1 INSTALLATION OF REPLACEMENT WELLS PW-1R AND PW-12R

During a pre-sampling site visit, monitoring wells PW-1 and PW-12 could not be located (apparently UM's facility maintenance inadvertently paved or landscaped over the wells). Consequently, by its letter dated 3 March 1999, the EPA approved the replacement of PW-1 and PW-12 at the same general locations.

On 29 March 1999, ERM installed the two replacement monitoring wells. The replacement wells are designated as PW-1R and PW-12R, and their well logs are found in Appendix B.

2.2 GROUND WATER SAMPLING

Ground water sampling events were performed in April 1999 and March 2000. By letter dated 17 August 1999, ERM provided copies to EPA of the field notes generated during the April 1999 sampling event. Appendix C provides a copy of the field notes generated by ERM during the March 2000 sampling event.

Figure 2 shows that monitoring well locations for the Paint Branch Landfill Areas. Note that in March 2000, UM retained ERM to analyze historic aerial photographs associated with Paint Branch Landfill Areas 1 and 2 for facility planning purposes. As a result, the perimeters for these two landfill areas in Figure 2 have been modified slightly to reflect the findings of the photographic analysis. Figure 3 shows the well locations for the Metzerott Landfill.

2.2.1 April 1999 Ground Water Sampling Event

The ground water sampling and analyses methods used in April 1999 were performed in accordance with the EPA-approved 16 February 1999 RFI Addendum Plan. Accordingly, the monitoring wells were sampled using low flow sampling methods to ensure collection of representative ground water samples. Table 1 lists the monitoring wells that were used for ground water sampling and water level measurements. As documented in R&R's RFI Report, wells PW-2, PW-3, and PW-6 are unsuitable for sampling, and were not used for the RFI Addendum. The monitoring wells were also re-surveyed for vertical elevations, the results of which are found in Table 1.

Table 2 summarizes the analyses performed. As required by the RFI Addendum Work Plan, ERM collected two sets of ground water samples for analyses of

metals and PCBs. One set was collected from the low flow sampling discharge line without any field filtering (referred to herein as "total"). The other set was also collected from the low flow sampling discharge line but after passing through a 45 micron filter (i.e., field filtered to remove suspended solids). The filtered PCB samples were not analyzed by the laboratory because PCBs were not detected in the samples for total PCBs.

Quality control (QC) samples submitted with the ground water samples consisted of blind duplicates (blind duplicate collected for MW-8, which was labeled as MW-8D), equipment rinseate blanks, matrix spike/matrix spike duplicates (MS/MSD), and replicates. Trip blanks were also submitted for methane analysis. ERM validated the total metals, PCB and dioxin results in accordance with the EPA-approved 16 February 1999 RFI Plan Addendum. The results for the filtered metals samples were not validated.

ERM's Quality Assurance Report (QAR), which summarizes the validation results, is found in Appendix D. The laboratory deliverables for the April 1999 ground water samples are also found in Appendix D.

The laboratory analyses for all metals and PCBs were performed by Phase Separation Science, Inc. (PSSI). The dioxin analyses were performed by Triangle Laboratories, Inc. (TLI) under subcontract to PSSI. Maryland Spectral Services, Inc. (MSS) performed the methane analyses, also under subcontract to PSSI. Although not identified in the 16 February 1999 RFI Plan Addendum, MSS was used by PSSI due to instrumentation problems at PSSI at the time the samples were collected for analysis.

As requested by the EPA, a Performance Evaluation (PE) sample for metals was analyzed by PSSI. The results of the PE analyses are also found in Appendix D.

2.2.2 March 2000 Ground Water Sampling Event

As required by the EPA in its letter dated 21 October 1999, discrete ground water samples for dioxin analysis were collected from monitoring wells PW-7, PW-9, and PW-13. Each of these wells is located in the Paint Branch Landfill Areas.

The ground water samples were collected on 16 March 2000 using the methods in the EPA-approved 16 February 1999 RFI Plan Addendum. The samples were collected without field filtering so the results represent total concentrations. The QC samples consisted of a blind duplicate of PW-13, which was labeled PW-13D, and one equipment rinseate blank labeled EB-1 (3/16/00). The analyses were performed by TLI under subcontract to PSSI.

The dioxin results were reviewed by an ERM quality assurance (QA) chemist, and validated appropriately. The results of the quality assurance review are

summarized in ERM's memorandum found in Appendix E. The laboratory reporting forms and data deliverables for March 2000 are also in Appendix E.

On 16 March 2000, ERM also sampled PW-12R for temperature and pH. ERM measured these parameters in the field during well purging by the low flow sampling technique. ERM used properly calibrated field instruments to measure temperature and pH.

2.3 SOUNDING OF MONITORING WELLS

On 7 March 2000, ERM sounded the ground water monitoring wells at the Paint Branch Landfill Areas and Metzerott Landfill. The results are summarized in Table 1.

ERM's results were comparable to those results reported by R&R in its 1996 RFI Report. With the exception of MW-2 and MW-4, the depths measured by ERM were within 1.5 feet or less of the well depths reported by R&R in its 6 August 1996 RFI Report. At MW-2, ERM's measured well depth was 4.18 feet shallower than that reported by R&R. At MW-4, ERM's measured well depth was 5.59 feet deeper than that reported by R&R. Nonetheless, the well depths are considered satisfactory by ERM to assess ground water conditions at the Paint Branch Landfill Areas and Metzerott Landfill.

2.4 HEADSPACE MEASUREMENTS FOR POTENTIAL ORGANIC VAPORS AT THE MONITORING WELLS

On 7 March 2000, ERM used an organic vapor analyzer (OVA) equipped with a flame ionization detector (FID) to measure potential total organic vapor concentrations in the headspace of each ground water monitoring well. The total organic vapors that can be detected by the OVA FID include methane. At this same time, an explosimeter was used to measure for possible combustible gases in the headspace of each monitoring well. Both instruments were calibrated according to manufacturer's specifications.

The headspace measurements were taken by inserting the instrument probes into the well casing immediately upon removing the cap from each well. The initial instrument readings and the sustained readings (after about 1 to 3 minutes of testing) were recorded by ERM in the project field book for the OVA and explosimeter.

3.1 PAINT BRANCH LANDFILL AREAS

3.1.1 Ground Water Flow

The depths to ground water ranged from about 19 feet below ground surface at PW-10 to 4 feet at PW-1R. Ground water elevations (Table 1) were calculated using ground water level measurements collected on 19 April 1999 and 7 March 2000.

The ground water elevation data from 19 April 1999 were used to construct the ground water elevation contour map in Figure 2. The ground water elevation contour pattern shown in Figure 2 is consistent with the ground water flow direction reported by R&R in their RFI Report. The ground water flow pattern from the elevations collected on 7 March 2000 is also similar to that shown in Figure 2.

Horizontal ground water flow is to the east/northeast towards Paint Branch. Based on the landfill area boundaries, ground water monitoring wells PW-1R, PW-4, PW-10, PW-11 and PW-12R are upgradient wells. Ground water monitoring wells PW-3, PW-7, PW-8, PW-9, and PW-14 are located on the downgradient edges of the landfill areas. Ground water monitoring well PW-5 is located just within the upgradient boundary of landfill area 3.

Regarding the potential vertical flow component, the close proximity of the landfill areas next to Paint Branch indicates that the landfills are in an area of ground water discharge. Therefore, ERM interprets the predominant vertical hydraulic gradient as upward. Consequently, ground water flow from the Paint Branch Landfill Areas would discharge into Paint Branch.

3.1.2 Ground Water Quality

ERM

Table 3 summarizes the ground water analytical results for the metals, PCBs, methane and total suspended solids (TSS) analyses. Table 4 presents the dioxin results. The following information is also included in these tables: the Practical Quantitation Limit (PQL); Permit specified HBNs; Maximum Contaminant Levels (MCLs); and EPA Region III Risk Based Concentrations (RBCs) for tap water. Ground water is not a current or future source of potable water within approximately one square mile of the Paint Branch Road Landfill Areas or the Metzerott Road Landfill.

Ground water monitoring wells PW-7, PW-9 and PW-13 were sampled for total PCB analyses. As shown in Table 3, PCBs were not detected in any of these three wells (the PCB detection levels were 5 micrograms per liter $[\mu g/L]$). Therefore, no further action for PCBs is warranted.

Metals (Total and Filtered Samples)

Some of the results for the filtered samples are higher than the associated results for the total samples. Regardless, the analytical results for the total and filtered samples showed reasonable agreement except for barium and zinc. As a conservative measure, however, ERM's evaluation of the metals data used the higher of the concentrations between the total and filtered samples for comparison to HBNs, MCLs, or RBCs.

There were no metals detected in any of the downgradient wells at concentrations above their respective HBNs. For the upgradient wells, lead in the total samples was detected in wells PW-1R, PW-11 and PW-12R at concentrations just marginally above its HBN. The maximum lead concentration was 7.7 μ g/L in upgradient well PW-11, which is slightly greater than its HBN of 5 μ g/L but below EPA's suggested action level for lead of 15 μ g/L. Lead was not detected above its HBN in any of the filtered samples. The only other metals detected above their HBNs were beryllium, selenium and nickel at upgradient well PW-12R, as follows:

- The maximum detected beryllium concentration was 11 µg/L in the filtered sample. The HBN and MCL for beryllium is 1 and 4 µg/L, respectively. Beryllium was not detected in any of the other upgradient or downgradient wells at concentrations above either its HBN or MCL;
- The maximum detected selenium concentration was 64 μg/L in the filtered sample. The HBN and MCL for selenium is 50 μg/L. Selenium was not detected or detected at concentrations well below its HBN at the other upgradient and downgradient wells.
- The maximum detected nickel concentration was 260 μg/L in the filtered sample. This concentration is above the HBN for nickel of 100 μg/L, but well below its RBC for tap water of 730 μg/L. Nickel was detected at concentrations well below its HBN and RBC at the other upgradient and downgradient wells.

Based on the above, the total and filtered metals results are not considered by ERM to be environmentally significant. Furthermore, ground water is not a source of potable water in the area, and R&R's RFI Report showed that sediments and surface water at Paint Branch are not adversely impacted by metals. Consequently, the data indicate that the landfill areas have not released any

Permit-list metals at levels of concern, and no further action regarding metals is warranted.

Dioxin

Table 4 presents the dioxin results for the Paint Branch Landfill Areas. In April 1999, grab samples were collected from ground water monitoring wells PW-7, PW-9 and PW-13 for compositing by the laboratory. On 16 March 2000, discrete ground water samples were collected from these same wells. These composite and discrete samples were analyzed for dioxins.

The only dioxin present in the composite sample were the congeners 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8-HpCDF and 1,2,3,4,6,7,8,9-OCDF. The maximum concentration was 284 parts per quadrillion (ppq) of 1,2,3,4,6,7,8,9-OCDD. The other three congeners were detected at values of 35J ppq or less ("J" qualified as a quantitative estimate). In fact, the concentrations of 1,2,3,4,6,7,8-HpCDD and 1,2,3,4,6,7,8-HpCDF were qualified as quantitative estimates because the values were below the Target Detection Limit (TDL) of 10 ppq for dioxins. Data validation determined that the other dioxin congeners were not present in the sample.

The dioxin results for the discrete samples from PW-7, PW-9 and PW-13 were lower than the composite sample results, as follows:

- At PW-7, the only dioxin reported by the laboratory were trace levels of the congeners 1,2,3,4,6,7,8,9-OCDD and 1,2,3,4,7,8-HxCDF. However, these results were qualified with a "B" indicating that comparable concentrations were detected in the associated equipment rinseate blank (EB-1 for 3/16/00 in Table 4);
- At PW-9, the only dioxin reported by the laboratory were trace levels of the congeners 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8,9-OCDF, and 1,2,3,4,7,8-HxCDF. However, these results were also qualified with a "B" indicating that comparable concentrations were detected in the associated equipment rinseate blank (EB-1 for 3/16/00 in Table 4);
- At PW-13, the only reported results not qualified with a "B" were trace levels of 1,2,3,4,6,7,8-HpCDF, 1,2,3,7,8,9-HxCDD, 1,2,3,7,8-PeCDF, and 1,2,3,6,7,8-HxCDF. The concentrations for these dioxin congeners were 3 ppq or less, and were "J" qualified for the following reasons: first, the results were considered quantitative estimates because none of them were detected in PW-13D, which is the blind duplicate for PW-13; second, each reported concentration was below the TDL for dioxin.

The source of the dioxin in the ground water samples is not known, especially since dioxins are virtually insoluble and have a strong affinity for adsorption onto organic and colloidal material. However, dioxins are products of the combustion

of plastics and other materials, and therefore could have been derived from the fly ash placed in the landfills during their operation. This supposition is reasonable given the fact that fly ash was reportedly placed in landfill areas 1 and 3, and that PW-7, PW-9 and PW-13 are at the edge of or just downgradient of these landfill areas. Given its insolubility, the dioxin detected in the composite sample is probably from fly ash colloids at or near the wells. A fly ash source is suggested by the enrichment of hepta and octa-chlorinated congeners, typical of combustion processes.

The dioxin data were converted to 2,3,7,8-TCDD equivalents (TEQs), the results of which are presented in Table 5. The total TEQ for the composite sample was 0.4403 ppq. The highest total TEQ for the discrete samples was 0.619 ppq for PW-13. In either case, these dioxin concentrations are well below its MCL value of 30 ppq for 2,3,7,8-TCDD. Consequently, the dioxin levels detected in the composite and discrete samples are not considered significant, and no further action is warranted.

Methane

Ground water samples from wells PW-7, PW-9, and PW-13 were analyzed for methane. The results showed low to trace levels of methane in each of the three wells (Table 3). At PW-7, which is downgradient of landfill area 3, methane was detected in ground water at a concentration of 4,000 µg/L (which is 4 milligrams per liter [mg/L]). At PW-9 and PW-13, the methane concentrations in ground water were at 180 µg/L and 16 µg/L, respectively.

The methane results indicate that the landfill areas are not a major or widespread source of methane since its maximum concentration of 4,000 μ g/L is well below the solubility of methane, which is 25,000,000 μ g/L. Any large or extensive source of methane would be expected to generate ground water concentrations closer to its solubility (in the percent range), especially for situations where the water table is fairly shallow, such as at PW-7, PW-9 and PW-13 where the ground water level is about 10 feet below grade. Most likely, the source of the methane is from organic material in the trash that was placed in the landfills, which has biodegraded over the last 30 years or so. Since trash would have only been a portion of the material placed in the landfill areas, the detection of low methane levels in the ground water samples indicate that some of these trash pockets may be biodegrading.

ERM and UM performed a thorough walkover of the Paint Branch Landfill Areas to determine if there are any potential subgrade structures (e.g., manholes, utility trenches, basements) that could be accumulation points for gas. The purpose of the investigation was to ensure that the methane detected in ground water was not symptomatic of a potentially explosive problem, and to ensure the safety of UM personnel. The walkover identified 19 subgrade structures, consisting of 12

structures on and around landfill area 1 and 7 on landfill area 3. There are no above or below grade structures built on landfill area 2.

At each of these subgrade structures, ERM screened the ambient air for combustible gases using an explosimeter. At landfill area 1, the explosimeter did not detect any combustible gases in 7 of the 12 sample locations. At the other 5 locations, the explosimeter registered 4 to 8% of the lower explosive limit (LEL), which indicates that the air is not combustible, but that combustible gases may be present at low levels (100% LEL indicates that combustible levels may be present given an ignition source and sufficient oxygen). However, only one location (a utility trench in a parking lot) warranted follow-up as it was evident that the other locations where percent LEL was recorded contained debris such as decaying vegetation that could generate methane. At another location, the explosimeter measured zero percent LEL during subsequent testing.

Regarding landfill area 3, it is solely occupied by the Maryland Fire and Rescue Institute (MFRI), where test fires for training are performed. ERM detected percent LEL in 2 of the 9 subgrade structures at MFRI. One structure was a valve pit for a water line. At this location the explosimeter measured at least 100% LEL. MFRI personnel informed ERM that they were aware of this condition, and, in fact, use this valve pit as part of their safety training for testing atmospheres. The other location was a sanitary manhole, which registered 4% LEL. The sanitary manhole was not considered a concern because the sanitary wastes would be the source of any gases. Furthermore, the explosimeter measured only 4% LEL, showing that it was not a potentially combustible atmosphere.

As a follow-up, ERM collected air samples from the utility trench at landfill area 1 and the valve pit at MFRI for laboratory analyses by PSSI for Target Compound List (TCL) VOCs by method 8240, C1 through C4 hydrocarbons by method EPA 8015M, and total petroleum hydrocarbons (TPH) also by method EPA 8015M. The only constituent detected in the air sample from the utility trench was methane at a concentration of 290 parts per million (ppm). For the valve pit air sample, methane was detected at a concentration of 5,544 ppm, and TPH was detected at a concentration of 350 parts per billion (ppb).

The laboratory test results for the air samples indicate that methane is present in the air at these two locations. The detected methane concentrations in the second round of air sampling are, however, well below the LEL for methane, which is 50,000 ppm or 5%. The trace levels of TPH in the valve pit sample indicate that some petroleum hydrocarbons were present in the air.

Regarding the valve pit, it is addressed under UM's confined space entry program. In fact, MFRI personnel are the only authorized entrants to the valve pit. Note that MFRI personnel teach confined space entry procedures and entry

into potentially hazardous atmospheres, and are authorized to implement UM's confined space entry program.

As recommended in the Interim RFI Addendum Report, ERM and UM performed an additional survey of potential subgrade structures at the Paint Branch Landfill Areas on 18 August 1999. The survey covered the areas highlighted in Figure 2. The survey determined that there were no other subgrade structures where landfill gas could accumulate.

As a follow-up to these results, UM's Department of Environmental Safety has prepared a methane monitoring plan for the Paint Branch Landfill Areas, which is Appendix F. As a new addition, Appendix F contains Figure 2 of the Methane Monitoring Plan. The monitoring plan will be implemented by UM staff.

Headspace Measurements

Table 6 presents the results of the OVA FID headspace measurements from the monitoring wells at the Paint Branch Landfill Areas. The OVA FID did not detect any organic vapors at wells PW-5, PW-9, PW-11, PW-12R, PW-13, or PW-14. Except for PW-10, the other OVA FID results were 10 ppm or less. At PW-10, the OVA FID detected 100 ppm total potential organic vapors. As shown in Table 6, the explosimeter results ranged from background to 30% LEL.

The headspace results indicate that the landfill areas are not major or widespread sources of organic vapors such as methane. The explosimeter demonstrated that none of the wells contained gas at potentially combustible levels since all measurements were well below 100% LEL.

Ground Water Temperature and pH at PW-12R

Table 7 summarizes the ground water temperature and pH measurements collected at PW-12R. The ground water temperature stabilized at 21.40 degrees Celsius. The ground water pH stabilized at 3.45.

ERM acknowledges that the ground water temperature at PW-12R is elevated compared to normal ground water conditions. The cause of this occurrence is unknown, however, it may be associated with the close proximity of this well to underground lines used to convey steam and condensate from the facility's steam plant. The reason for the low pH relative to normal ground water conditions is not known. Nonetheless, as requested by EPA in its 13 February 2001 letter (comment No. 2), UM expended additional time and effort to further assess the potential cause of the high temperature and low pH measured at PW-12R, the findings of which are presented below.

UM's Department of Environmental Safety (DES) contacted several long-term employees of the Steam Plant to discuss the PW-12R findings. These individuals included Mr. George White, who has been affiliated with the Steam Plant for over 25 years, and Mr. Bobby Allen, a senior plumber from UM's plumbing shop. Mr. Allen has been with UM for over 20 years. Other individuals interviewed by DES included Mr. Jim Hogan, the plumbing shop supervisor, and Mr. Tim Dickerson of Trigen-Cinergy Solutions of College Park, which manages the steam plant under contract to UM.

Based on the aforementioned interviews, a possible source of the high ground water temperature may be a near-by storm water discharge line (about 30 feet from PW-12R) that carries boiler blowdown at temperatures most likely above 100°F. This line is relatively close to PW-12R and could possibly cause the rise in ground water temperature observed at the monitoring well. Another potential source of heat to the ground water may be from hot water in a near-by steam return line. This line is about 40 to 50 feet from PW-12R, and conveys water at a temperature of about 150°F.

Regarding pH, none of the individuals interviewed were able to identify any source of acid that could lead to low pH in the ground water at PW-12R. Sulfuric acid is used to treat the blowdown prior to its discharge to the storm water line described above. However, this system is a closed system, with the piping and holding tank constructed aboveground, and computer metered. The blowdown pH, which is continuously monitored, targets 7.5. No one had any knowledge of acid releases from cleaning tubes or other equipment within the plant.

A possible source of the low pH n ground water at PW-12R may be the oxidation of pyrite and/or other sulfide minerals in coal fines that may be in the soil from when the plant was run on coal. Low pH has not been observed in any of the wells downgradient or cross gradient of PW-12R.

3.2 METZEROTT ROAD LANDFILL

3.2.1 Ground Water Flow

The depths to ground water ranged from about 46 feet below grade at MW-5, which is located along the top of a ridge, to artesian conditions at MW-4, which is located at the toe of the landfill. Ground water elevations (Table 1) were calculated using ground water level measurements collected on 19 April 1999 and 7 March 2000.

The ground water elevation data were used to construct the ground water elevation contour map in Figure 3, which is consistent with the contour pattern reported by R&R in their RFI Report. The ground water elevation pattern for the

elevations measured for 7 March 2000 are also similar to the flow pattern shown in Figure 3.

Horizontal ground water flow is to the south, towards the head waters of a small tributary to Paint Branch. Based on the landfill boundary, ground water monitoring wells MW-1, MW-5 and MW-6 are upgradient of the Metzerott Landfill. Ground water monitoring wells MW-2, MW-3, and MW-4 are downgradient wells. MW-7 is a cross gradient well. Ground water monitoring well MW-8 is located within the landfill area.

Regarding the potential vertical flow component, the area topography and ground water flow data indicate that the predominant vertical hydraulic gradient is upward. This is most evident from MW-4, which exhibits artesian conditions. Consequently, ERM interprets the ground water flow from the landfill area to discharge into the tributary.

3.2.2 Ground Water Quality

Table 8 summarizes the ground water analytical results for the metals, PCBs, methane and TSS analyses. Table 4 presents the dioxin results.

PCBs

Ground water monitoring well MW-8 was sampled for PCB analyses. As shown in Table 7, PCBs were not detected in MW-8 or its associated blind duplicate (MW-8D) or its replicate. The detection levels for PCBs were 5 μ g/L. Therefore, no further action regarding PCBs is warranted.

Metals (Total and Filtered Samples)

Some of the results for the filtered samples are higher than the associated results for the total samples. Regardless, the analytical results for the total and filtered samples showed reasonable agreement except for barium and zinc. As a conservative measure, however, ERM's evaluation of the metals data used the higher of the concentrations between the total and filtered samples for comparison to HBNs, MCLs, or RBCs.

Silver was not detected in any of the ground water samples. Arsenic, barium, lead, vanadium and zinc were not detected in any of the total or filtered samples above their respective HBNs. Although chromium, nickel, selenium, antimony, beryllium, cadmium, mercury and thallium were sporadically detected at concentrations above their HBNs, the concentrations were too low to warrant concern, or were spatially distributed indicating that they either occur naturally or are significantly attenuated by natural processes.

At MW-8, which is located within the Metzerott Landfill and would represent worst case affects from the landfill, chromium, nickel and selenium were detected at levels above their respective HBNs. Of these metals, however, nickel and selenium were also detected at comparable concentrations in the upgradient wells, indicating the natural occurrence of these metals in the ground water, as follows.

- Chromium was detected at a maximum concentration of 230 μg/L in the filtered sample from MW-8, which is above its HBN of 100 μg/L. However, chromium is readily attenuated in the ground water, as evidenced by the fact that that there were no valid detections of chromium in any of the downgradient wells. All chromium detections for the total and filtered samples for the other seven monitoring wells were 5 μg/L or less, and were "B" qualified because chromium was also detected in associated blanks at similar concentrations.
- Nickel was detected in upgradient wells MW-1, MW-5 and MW-6 at concentrations higher than or comparable to those concentrations detected at MW-8 and the downgradient wells. In fact, the highest concentration of nickel was detected in upgradient well MW-5 at 290 μg/L in both the total and filtered samples, which is above its HBN of 100 μg/L. The presence of nickel in this upgradient well, at a concentration more than twice the value detected at MW-8 and the downgradient wells, indicates that nickel is not derived from the landfill. Regardless of its source, all nickel concentrations for the total and filtered samples for all wells are below its RBC for tap water, which is 730 μg/L.
- Selenium was detected at a maximum concentration of 62.8 μg/L in the total sample from MW-8, which is above its HBN and MCL of 50 μg/L. Selenium was, however, also detected in upgradient well MW-5 at a maximum concentration 30.8 μg/L, which indicates that selenium occurs naturally at concentrations comparable to those detected at MW-8 and the downgradient wells. The selenium results for the other seven upgradient and downgradient wells for both total and filtered samples were 33 μg/L or lower, which is below its HBN.

The remaining metals antimony, beryllium, cadmium, mercury and thallium were sporadically detected in the upgradient and downgradient monitoring wells at concentrations only marginally above or well below their respective HBNs, if detected at all. For example, antimony was only detected in the filtered sample from upgradient well MW-6 at a trace level of 6 μ g/L. All other antimony results were non-detect. Another example is beryllium. As shown in Table 8, the maximum beryllium concentration was detected in the total sample from upgradient well MW-5 at a concentration of 13.2 μ g/L, which is at least 6 times higher than any of the levels detected in MW-8 or the downgradient wells.

In summary, the total and filtered metals results are not considered by ERM to be environmentally significant. Consequently, the data indicate that the landfill has

not released any Permit-list metals at levels of concern, and no further action regarding metals is warranted.

Dioxin

MW-8 was sampled for dioxin analysis, the results for which are presented in Table 4. The only dioxin congeners present in the sample were 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8-HpCDF and 1,2,3,4,6,7,8,9-OCDF. The maximum concentration was 3,070 parts ppq for 1,2,3,4,6,7,8,9-OCDD. The other three congeners were detected at values of 145 ppq or less in MW-8 and its associated blind duplicate MW-8D. The congener 1,2,3,4,6,7,8,9-OCDF was detected in MW-8 at 799J ppq but it was not present in its blind duplicate making its detection suspect. Therefore, it was qualified with a "J" as a quantitative estimate.

As discussed for the Paint Branch Landfill Areas, the source of the dioxin in the ground water sample is not known. It could possibly be derived from fly ash placed in the Metzerott Landfill. Consequently, given its insoluble nature and strong affinity for adsorption onto organic and colloidal material, the detection of dioxin at MW-8 is probably from fly ash colloids at or near MW-8.

Nonetheless, ERM does not consider the dioxins to be significant because of the low levels detected. Specifically, the dioxin results were converted to TEQs, which are presented in Table 5. The total TEQ for MW-8 (using the highest concentrations from MW-8 and its associated duplicate) is 5.6 ppq, which is well below its MCL of 30 ppq. Consequently, the dioxin level detected in the sample is not considered significant.

Methane

Methane was detected in MW-8 and its associated duplicate MW-8D at concentrations of 7.9 mg/L and 8.4 mg/L, respectively (Table 8). Although the data are inconclusive regarding the source of the methane, it is most likely derived from the organic content of trash that was placed in the landfills, which over the last 30 years or so has biodegraded. A contributing factor could also be the biodegradation of buried plant material associated with the floodplains of the tributary at the toe of the landfill. Nonetheless, compared to its solubility of $25,000,000~\mu g/L$, the trace level of methane in ground water indicates that any gaseous phase concentrations of methane in the landfill would not approach its LEL of 50,000~ppm.

As a conservative safety measure, however, ERM and UM performed a thorough walkover of the Metzerott Landfill and adjoining areas (similar to that described for the Paint Branch Landfill Areas). This walkover determined that there are no

subgrade structures present, and therefore, there are no accumulation points for gas.

Headspace Measurements

Table 6 presents the results of the OVA FID headspace measurements from the monitoring wells at the Metzerott Landfill. The OVA FID did not detect any organic vapors at wells MW-1, MW-3, MW-5, MW-6, and MW-7. At MW-2, the initial and sustained OVA FID measurements were 100 ppm and 10 ppm, respectively. At MW-8, the OVA-FID measured greater than 1,000 ppm. As shown in Table 6, the explosimeter results were mostly background to 1% LEL. At MW-8 and MW-2, the explosimeter measured initial readings of 15% and 45% LEL, respectively.

The headspace results indicate that the landfill is not major or widespread source of organic vapors such as methane. The explosimeter demonstrated that none of the wells contained gas at potentially combustible levels since all measurements were well below 100% LEL. Furthermore, a walkover of Metzerott Landfill determined that there are no subgrade structures present, and therefore, there are no accumulation points for gas.

4.0 FATE AND TRANSPORT

Fate and transport processes for metals, dioxin and methane at the Paint Branch Landfill Areas and Metzerott Landfill are discussed below. Since PCBs were not detected in any of the ground water samples, a discussion of its fate and transport is not needed.

The ground water flow data indicate that ground water from the Paint Branch Landfill Areas and Metzerott Landfill would discharge to surface water. At the Paint Branch Landfill Areas, ground water would discharge into Paint Branch. At the Metzerott Landfill, ground water would discharge into the small unnamed tributary of Paint Branch. Since both of these streams are perennial, and the vertical hydraulic gradient would be upward, ground water would not be expected to underflow either stream. Consequently, ground water from the landfills would not migrate beyond these streams.

4.1 METALS

Along the ground water flow path, the fate and transport of metals would be dominated by sorption and coprecipitation processes involving hydrous iron and manganese oxides. Furthermore, lacking any significant source, as is the case with the Paint Branch Landfill Areas and Metzerott Landfill, the concentrations of metals would decrease along the flow path due to ground water dispersion and dilution by infiltrating precipitation.

The natural attenuation processes discussed above are empirically evident at the Paint Branch Landfill Areas and Metzerott Landfill. For example, at the Paint Branch Landfill Areas, the maximum selenium concentration was detected in upgradient well PW-12R at 64 μ g/L; however, the downgradient wells showed no valid selenium detections. Similarly, at the Metzerott Landfill, the maximum nickel concentration was detected in upgradient well MW-5 at a concentration of 290 μ g/L, which was more than double the concentrations detected in any of the downgradient wells.

The empirical data from the RFI Addendum show that naturally occurring attenuation processes reduce the concentration of metals along their flow paths. This empirical evidence is further supported by R&R's RFI Report, which documented that the sediments and surface waters immediately downgradient of the landfills were not adversely affected by metals.

4.2 DIOXIN

Dioxin is virtually insoluble in water^{iv}, and has a high octanol/water partition (Kow) factor of greater than 10⁶. Compounds that exhibit Kow factors greater than 10⁴ are considered to be hydrophobic.

Dioxin is most likely sorbed onto colloidal fly ash. Along its ground water flow path, the trace dioxin concentrations would decrease to even lower values than those detected at monitoring wells PW-7, PW-9, PW-13 and MW-8 due to dilution and dispersion. The strong affinity of dioxin to sorb organic matter would further collaborate with dilution and dispersion to reduce these concentrations even further, rendering them practically immobile.

Given these physiochemical considerations and the fact that maximum total dioxin TEQ is 0.619 ppq at the Paint Branch Landfill Areas and 5.35 ppq at the Metzerott Landfill (which are much less than the 30 ppq MCL in ground water), it is extremely unlikely that dioxin would discharge into Paint Branch or its tributary at any level of potential concern. This conclusion can be demonstrated by performing simple and very conservative mixing calculations between ground water and surface water at the point of ground water discharge.

Figure 4 shows the ground water recharge area for Paint Branch above landfill area 3, which is the most downstream area. This recharge area was calculated as about 30.9 square miles. The degree of dilution that would occur for ground water discharging into Paint Branch can then be calculated from the following equation:

$$DF = (Q_r + Q_{gw}) / Q_{gw}$$
 (Equation 1)

where:

DF = the dilution factor from surface water and ground water mixing;

 Q_r = the flow rate in Paint Branch, under various flow conditions (i.e., median, base flow, or drought conditions [7Q10]);

Q_{gw} = ground water discharge into Paint Branch through a vertical cross section along the reach of Paint Branch perpendicular to the ground water flow direction along the length of the Paint Branch Landfill Areas (Figure 5).

Table 9 lists the parameters used with Equation 1 to calculate the minimum DF values that could be expected under average, median and drought conditions.

ERM 19 UM/M6106.00.01-04/06/01

^{iv} EPA Office of Ground Water and Drinking Water technical fact sheet on dioxins.

Dividing the TEQ by the DF values for the Paint Branch Landfill Areas shows that under the most conservative conditions, the maximum TEQ would be reduced to approximately 0.026 ppq under drought conditions and 0.0017 ppq under average flow conditions. Actual dioxin levels in ground water would be expected to be even lower since the calculated dilution factor ignores other attenuation processes such as dispersion and adsorption, and assumes that dioxin would be present at the point of ground water discharge at a concentration equal to the source concentration detected for the ground water samples.

A similar, conservative mixing calculation was performed for the Metzerott Landfill. However, since the Metzerott Landfill is located near the headwaters of the tributary, the DF value was calculated by comparing the volume of ground water contributed to the tributary solely from that portion of its ground water recharge area occupied by the Metzerott Landfill to the total recharge area of the tributary upgradient from the most downstream part of the Metzerott Landfill (Figure 5).

The landfill recharge area is about 310,000 square feet (ft²) for the Metzerott Landfill, while the entire area of the watershed upstream of the most downstream toe of the Metzerott Landfill is 750,000 ft². Making the reasonable assumption that the ground water flux into the stream is from the same infiltration rate throughout the watershed, the dilution that would occur simply from ground water and surface water mixing would be about 2.5 times (i.e., 310,000 ft² divided by 750,000 ft²).

Dividing the TEQ by the DF value for the Metzerott Landfill shows that under the most conservative conditions that exclude any other attenuation processes, the TEQ would be reduced to a concentration of about 2 ppq. This calculation conservatively assumes that the dioxin concentration at the point of discharge would be equal to its source concentration at MW-8. Realistically, however, the concentration at the point of discharge would be lower than the source concentration, which would increase the DF value and lower the calculated TEQ value.

To demonstrate how quickly additional dilution would occur from ground water and surface water mixing, ERM extended the same exercise above to include the watershed upstream of the small golf course pond that is about 1,500 feet downstream of the Metzerott Landfill, as shown in Figure 5. At this point, the total recharge area is about 4,360,000 ft². Dividing the total recharge area by the recharge area of the landfill produces a DF value of 14 by the time surface water travels from the landfill to the golf course pond. This would result in a very conservative TEQ estimate of 0.4 ppq.

Given the above, it is demonstrated that it is unlikely that dioxin would discharge into Paint Branch or its tributary at any level of concern, if at all. The calculated

DF values would increase (i.e., causing the TEQ values to be even lower than calculated) if more sophisticated modeling were performed that accounted for dispersion, dilution by infiltrating precipitation, and adsorption to organic materials.

4.3 METHANE

The low ground water concentrations of methane, the ambient air tests (screening with the explosimeter and collection of air samples for laboratory analyses) results, and the headspace analyses using the OVA-FID and explosimeter indicate that there is no significant or widespread source of methane at the Paint Branch Landfill Areas or Metzerott Landfill. In fact, the ambient air tests showed that methane concentrations were well below its LEL. Rather, the source of methane could be isolated pockets of trash or wood that is decomposing in the landfills (trash is probably interspersed with the other materials placed in the landfill), or other naturally occurring or anthropogenic sources such as buried vegetation that is decomposing along the former floodplains of the streams.

Nonetheless, the fate and transport of methane would be dominated by concentration gradients and pressure gradients. Under saturated conditions, methane will be present as a dissolved gas. Thus, methane present in ground water would migrate following the ground water flow path, and its concentration would decrease due to ground water dispersion, dilution, and volatilization. Volatilization into the atmosphere would occur as ground water discharges into either Paint Branch or its tributary at the Metzerott Landfill. Any trace levels in the surface water would quickly volatilize from the stream and dissipate into the atmosphere.

Under unsaturated conditions, methane migration would follow vapor pressure gradients to areas exposed to atmospheric conditions. Thus, methane would migrate upward through the soil profile and dissipate directly into the atmosphere. Lateral migration could occur if the predominant pressure gradient is along the lateral direction rather than vertical. As a result, methane could follow a rather convoluted pathway in the subsurface (depending upon the complexity of the geology and moisture content), and potentially volatilize into subgrade structures that would provide a conduit to the atmosphere. The methane survey of the Paint Branch Landfill Areas and the Metzerott Landfill showed that methane is not accumulating at levels above its LEL in any subgrade structure.

The barriers to methane migration at the Paint Branch Landfill Areas and Metzerott Landfill are Paint Branch and its small tributary, and the ground surface cover that exists in the developed parts of the Paint Branch Landfill Areas. A potential pathway for lateral gas migration to the landfill boundaries could be the unsaturated zone soils at the landfills. However, the headspace test results

indicate that there is no significant lateral migration of methane, if any at all, since the test results were well below methane's LEL, which demonstrates that the vapor phase in the well casings at these locations is not combustible.

5.0 QUALITATIVE RISK ASSESSMENT

The current land use of the Paint Branch Landfill Areas and Metzerott Landfill is non-residential, as demonstrated by UM to the EPA during the 1 October 1997 meeting. Based on the current land use, ERM concludes that the results of the RFI Addendum indicate that the landfills pose no unacceptable risks to human health or the environment, as discussed below.

5.1 GROUND WATER

The results of R&R's RFI and this RFI Addendum show that there are no VOCs, SVOCs or PCBs present at concentrations of concern in the ground water at the Paint Branch Landfill Areas. The RFI Addendum results show that the ground water at the Paint Branch Landfill Areas does not contain any metals above their HBNs downgradient of or within the landfills.

For the Metzerott Landfill, R&R's RFI and this RFI Addendum show that there are no VOCs, SVOCs or PCBs present in the ground water. The ground water results for the RFI Addendum show that metals were detected at concentrations too low to warrant concern, or were spatially distributed in a manner indicating that they occur naturally or are significantly attenuated by natural processes to concentrations below their HBNs in the downgradient wells. At both the Paint Branch Landfill Areas and Metzerott Landfill, dioxin was detected in ground water at trace levels, and well below its MCL of 30 ppq.

A well search using a database maintained by MDE showed that ground water is not used as a source of potable water at or within about one square mile of the Paint Branch Landfill Areas or Metzerott Landfill. In addition, the Prince Georges County 10-year water and sewer plan shows that municipal water is available within this area of College Park. Consequently, the County imposes a general prohibition on ground water use for areas serviced by the municipality, which virtually eliminates the potential for future ground water use in the area.

5.2 SURFACE WATER

R&R's RFI results for sediments, surface water and soil samples from the Paint Branch Landfill Areas and Metzerott Landfill did not indicate any release of Permit-list metals, VOCs or SVOCs. The RFI Addendum also determined that there are no PCBs in ground water for potential migration to surface waters.

Regarding dioxin, it is extremely unlikely that dioxin would discharge into Paint Branch or its tributary at any level of concern, if at all. This conclusion is supported by the application of the simple yet sound hydrogeologic modeling technique that used very conservative assumptions (no dilution, dispersion or sorption, and that the dioxin concentration at the point of discharge would equal the source concentration), as presented in Section 4 of this report.

The modeling exercise showed that ground water discharging from the Paint Branch Landfill Areas into Paint Branch would be diluted anywhere from 307 times under average flow conditions to 24 times under drought conditions. At the Metzerott Landfill, the model showed that dilution would be at least a factor of 2.5. Carrying through with these calculations, the worst-case surface water concentration resulting from the Paint Branch Landfill Areas at the modeled reach of Paint Branch would be 0.018 ppq to 0.026 ppq under drought conditions. The worst-case surface water concentration resulting from the Metzerott Landfill at the tributary would be about 2 ppq. These concentrations are well below Maryland's ambient water quality criterion (Code of Maryland Regulations [COMAR] 26.08.02.03-2) for human health exposure to dioxin of 30 ppq.

5.3 SOILS

The potential for unmonitored contact with the landfilled materials is considered negligible. The landfills are closed, and covered by vegetated cover soils, pavement, or buildings for beneficial use by UM. Walkovers of the landfills by UM and ERM indicate that there is no direct exposure to the underlying waste materials. In fact, test pits dug at the Metzerott Landfill by R&R showed that waste materials are not present below the top of the landfill until depths of at least 12 feet (i.e., there is at least 12 feet of soil cover above the landfilled material).

5.4 SOIL TO GROUND WATER PATHWAY

The potential for soils to leach contaminants into the ground water is considered negligible. Empirically, the results from R&R's RFI and this RFI Addendum demonstrate that there has been no significant source of ground water impact from the landfills over the last 30 years for which the landfills have been closed. The only constituents detected in this RFI Addendum in ground water were methane and metals, which occur naturally, and trace levels of dioxin. Neither metals nor dioxin readily dissolve (dioxin is virtually insoluble), so it is reasonable to conclude that leaching will not occur at significant levels in the future. Furthermore, a large portion of the ground surface of the Paint Branch Landfill Areas is covered by either buildings or pavement, which would significantly impede infiltration through unsaturated soils.

5.5 VAPORS

Methane was detected in ground water at levels well below its solubility point. An initial round of air sampling identified one location at Paint Branch Landfill Area 3 as having an LEL of 100%. Four other subgrade structures at Paint Branch Landfill Area 1 were identified as having levels of 4% to 8% LEL. Subsequent testing of the two locations with the highest measured LEL showed methane concentrations well below its LEL of 50,000 ppm. Furthermore, the results of the R&R RFI showed that other VOCs were not in the ground water at the Paint Branch Landfill Areas or Metzerott Landfill at concentrations of concern. The metals and dioxin detected in the ground water are non-volatile and would not generate vapors. In addition, there are no subgrade structures at the Metzerott Landfill.

5.6 ECOLOGICAL RECEPTORS

The landfilled materials are several feet below existing grade, and are not exposed at the ground surface. As a result, the potential for ecological exposure is minimal. Furthermore, current beneficial use and development of the Paint Branch Landfill Areas and Metzerott Landfill make them unsuitable as prime habitat for flora or fauna. R&R's RFI results for sediments, surface water and soil samples from the Paint Branch Landfill Areas and Metzerott Landfill did not indicate any release of Permit-list metals, VOCs or SVOCs at concentrations of concern. This RFI determined that PCBs are not present in the ground water that could migrate to the Paint Branch or its tributary.

Regarding dioxin, it is unlikely that dioxin would discharge, if at all, into Paint Branch or its tributary at any level of ecological concern. The only applicable Maryland surface water quality criterion for dioxin is for fish consumption, at a surface water concentration of 1.2 ppq TEQ. Fate and transport modeling showed that the worst-case surface water TEQ concentration resulting from the Paint Branch Landfill Areas would be about 0.018 ppq to 0.026 ppq under drought conditions. These maximum TEQs are well below the surface water quality criterion for dioxin.

The worst-case surface water concentration resulting from the Metzerott Landfill at the tributary would be about 2 ppq TEQ, which is only marginally above its surface water criterion of 1.2 TEQ. This is not considered a realistic concern for three reasons:

• The modeling exercise in Section 4 used the concentration at the point of discharge as equal to the source concentration at MW-8, and did not account for ground water dispersion, sorption or dilution with infiltrating rainwater along the ground water flow path. A more sophisticated modeling approach

ERM 25 UM/M6106,00.01-04/06/01

would result in a much lower calculated concentration from higher dilution values;

- The fate and transport calculations showed that the surface water concentration would be reduced by a factor of 14 by the time it reaches a UM golf course pond, 1,500 downstream of the Metzerott Landfill. The calculated TEQ concentration would be 0.4 ppq, which is almost an order of magnitude lower than the surface water criterion. A more sophisticated modeling approach that accounts for dispersion, dilution and sorption would result in a much lower calculated concentration;
- The Metzerott Landfill is located at the headwaters of the tributary on land owned by UM. These waters are not used for fishing.

5.7 SUMMARY

In summary, the data show that ground water, surface water, and vapors do not pose any unacceptable risks to human health or the environment. The potential soil to ground water pathway is negligible due to the low to insoluble nature of the detected constituents. Therefore, ERM concludes that the results of the RFI Addendum indicate that the landfills pose no unacceptable risks to human health or the environment. In the event that UM were to further develop these landfills such that the current exposure scenarios were to change, then the risk under contemplated future exposure scenario(s) would have to be evaluated.

ERM concludes that the Paint Branch Landfill Areas and Metzerott Landfill pose no unacceptable risk to human health or the environment. Consequently, ERM recommends no further action with regard to the ground water quality at the landfills.

Regarding methane, UM has developed and will implement a routine monitoring program for periodically inspecting subgrade structures in and around the landfills for potentially unacceptable levels of methane. A copy of the monitoring plan is attached as Appendix F.

The RFI Addendum shows that the ground water conditions beneath the Paint Branch Landfill Areas and Metzerott Landfill do not pose unacceptable risks to human health or the environment. As a conservative measure, however, UM concurs with EPA's request for the use of an easement as opposed to a restrictive covenant (Comment No. 7 in EPA's 13 February 2001 letter, Appendix A).

Therefore, in the event of any future conveyance, assignment or transfer of landfill area property, UM will expressly reserve in the deed or other instrument, "an irrevocable and permanent easement granting to UM the exclusive right to use the groundwater at or beneath the property for drinking purposes." Furthermore, as requested by EPA, UM will "enforce the terms of such easement against all subsequent grantees of an assignment or transfer of all or a portion of the landfill property or any real estate interest in such property."

UM also agrees to file a Notice of Use Restriction stating that the landfill areas have been used in the past as solid waste disposal areas. The Notice of Use Restriction will describe certain common activities that could result in undesirable exposures to the waste/contaminants at the landfill areas or could interfere with or adversely affect the landfill areas.

Finally, UM concurs that it will provide the disclosure of the Notice of Use Restriction in all deeds, leases and mortgages affecting the landfill areas, substantially in the form provided by the EPA in its 13 February 2001 letter. UM will provide EPA with a copy of the final deed filing for the Paint Branch Landfill Areas and the Metzerott Road Landfill.

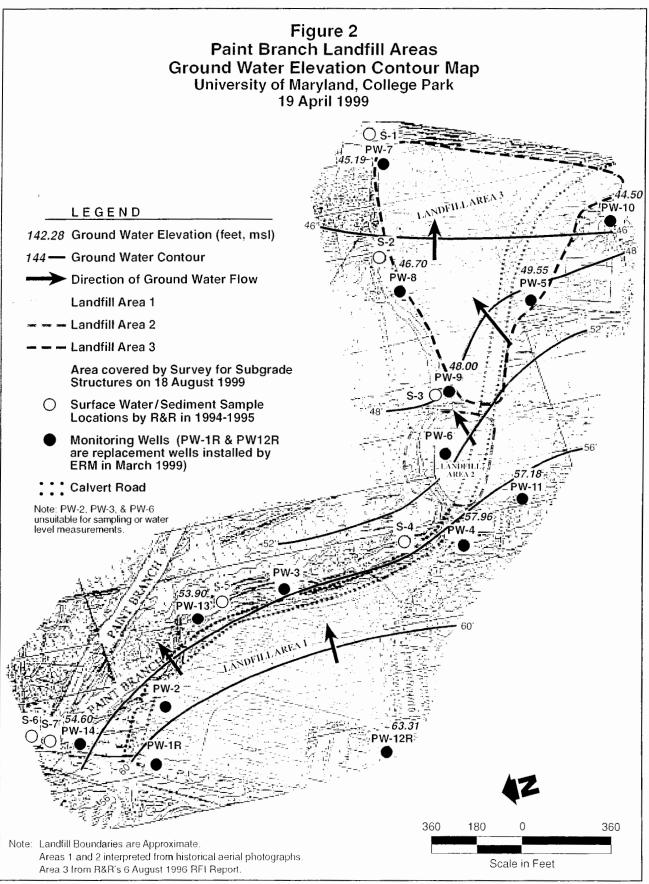
In accordance with Part 1 Section B Paragraph 11.e. of the Permit, UM shall inform EPA at least 30 days prior to any planned physical alterations or additions to the Paint Branch Landfill Areas and/or the Metzerott Landfill. If UM were to contemplate future development of the Paint Branch Landfill Areas and/or the Metzerott Landfill for land uses different from those currently in place, a risk

assessment of realistic exposure scenarios reflecting those land uses and/or construction activities would have to be performed to determine if there would be any unacceptable risks.

In response to EPA's comment No. 5 in its 13 February 2001 letter, UM has a system to prevent to the extent practicable human exposure to subsurface materials at the landfills. UM's Safety and Code Services Group, which consists of a Fire Marshal and two industrial hygiene/environmental, specialists, review all plans and specifications for capital and non-capital construction projects. This group is also responsible for reviewing all planned construction to identify potential environmental hazards and necessary permits. The Safety & Code Services group reports to the Assistant Director of Environmental Affairs (currently Mr. Scott Lupin) within DES.

In addition to this existing organizational structure, DES is creating a Senior Environmental Permitting Coordinator position that will also report to the Assistant Director of Environmental Affairs. The individual's role will be to work with all facilities construction project managers to identify necessary environmental permits, schedules, agency notifications, as well as fulfill a QA/QC role in terms of permit review. This individual will also consult UM's Facility Planning Group in the siting of new facilities and in facility renovations. As such, this individual will be in position to notify EPA of any planned projects that may result in construction within the landfill areas. The position is currently under development and is expected to be filled by Fall 2001.





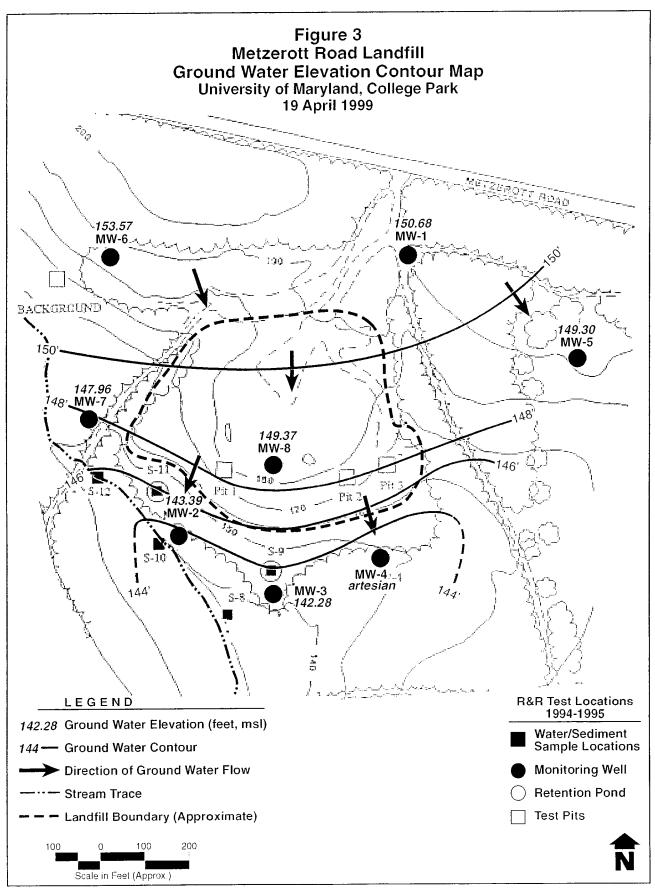




Table 1
Ground Water Monitoring Details and Ground Water Elevations
University of Maryland, College Park

						ater Elevations pril 1999		ater Elevations arch 2000
	Total	Screen	Ground Surface	Reference	DTW	Gr. Water	DTW	Gr. Water
Well	Depth BGS(ft)	Length (ft)	Elev. (ft msl)	Elev. (ft msl)	(ft)	Elev. (ft msl)	(ft)	Elev. (ft msl)
77611	Deptil Dee(it)	Longar (it)	Liov. (it mor)	Liov. (it mol)	(,	Ziori (it ilion)	(/	
Metzerott R	oad Landfil							
MW-1	54.44	10	193.71	195.41	44.73	150.68	46.13	149.28
MW-2	14.72	10	141.96	145.74	2.35	143.39	2.45	143.29
MW-3	15.32	10	140.56	143.83	1.55	142.28	1.59	142.24
MW-4	19.59	10	145.00	146.36	artesian	artesian	artesian	artesian
MW-5	52.09	20	191.56	194.47	45.17	149.30	46.24	148.23
MW-6	35.14	20	180.27	183.01	29.44	153.57	29.34	153.67
MW-7	20.27	10	150.87	153.71	5.75	147.96	6.94	146.77
MW-8	44.75	10	184.95	187.29	37.92	149.37	38.57	148.72
Paint Branc	h Road Landfill A	reas						
PW-1R	14.8	10	67.26	66.72	4.42	62.30	4.30	62.42
PW-2	25	5						
PW-3	22	15						
PW-4	34.62	15	63.91	63.68	5.72	57.96	5.40	58.28
PW-5	19.25	10	58.98	60.99	11.44	49.55	11.05	49.94
PW-6	23	15					-	
PW-7	28.21	15	56.58	56.24	11.05	45.19	11.03	45.21
PW-8	19.43	10	58.47	61.15	14.45	46.70	14.44	46.71
PW-9	17.16	10	56.05	58.42	10.42	48.00	10.09	48.33
PW-10	24.46	10	61.59	63.82	19.32	44.50	18.75	45.07
PW-11	21.33	10	63.93	66.79	9.61	57.18	9.40	57.39
PW-12R	21.65	10	72.52	72.13	8.82	63.31	8.46	63.67
PW-13	17.74	10	64.53	66.77	12.87	53.90	12.85	53.92
PW-14	15.23	10	63.25	65.38	10.78	54.60	10.31	55.07

Reference elevations are top of PVC riser pipe.

All elevations are in feet above mean sea level (msl).

PW-1R and PW-12R replaced PW-1 and PW-12, with similar construction.

BGS - below ground surface

Total depth measurements collected by ERM on 7 March 2000, except for PW-2, PW-3 and PW-6 which are from R&R's 6 August 1996 RFI Report.

Screen lengths from R&R's 6 August 1996 RFI Report, except for PW-1R and PW-12R which were installed by ERM in 1999 for the RFI Addendum.

Table 2 Summary of Ground Water Samples and Analyses
University of Maryland

Sample	Permit-List Metals	Methane	PCBs	Dioxins	Comments
Metzerott Road Landfill					
April 1999 Ground Water Sampling Event					
MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	Yes, total & dissolved	No	No	No	Total is non- filtered. Dissolved is filtrate of filtered samples.
MW-8	Yes, total & dissolved	Yes	Yes, total &, if needed, dissolved, plus a sample for TSS.	Yes for total only	Methane is non- filtered sample, collected prior to purging.
Paint Branch Landfill Areas					
April 1999 Ground Water Sampling Event					
PW-1R, PW-4, PW-5, PW-8, PW-10, PW-11, PW-12R, PW- 14	Yes, total & dissolved	No	No	No	
PW-7, PW-9, PW-13	Yes, total & dissolved	Yes (see comment for MW- 8)	Yes, total &, if needed, dissolved, plus a sample for TSS.	Yes, one composite sample for total only	PW-9 & PW-13 substitute for PW- 6 & PW-2, respectively.
March 2000 Ground Water Sampling Event		ng distribution programme and a second progra			
PW-7, PW-9, PW-13	No	No	No	Yes, for total only	Discrete samples analyzed.

All samples were collected using low-flow sampling methods as specified by EPA's letter dated 5 November 1998. TSS is total suspended solids.

Permit list metals are antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, thallium, vanadium, and zinc.

Permit-list metals analyzed by EPA 3010 and EPA 200.8 methods.

Methane analyzed by SM 6211B and SW 846 8015B Modified methods.

PCBs analyzed by EPA 3510 and SW 846 8082-P methods.

Dioxins analyzed by SW 846 8290 method.

TSS analyzed by EPA 160.3 method.

Table 3
Ground Water Results for Metals, PCBs, Methane and TSS
Paint Branch Landfill Areas
University of Maryland, College Park, Maryland

Monitoring Well ID	·			PW-1	R (8)	PV	V-4	PW	/-10	PV	V-11	PW-1	12R (8)	P	V-5	PW	-7	PV	V-8		V-9		-13	1	V-14		-1 (7)
Date Sampled				4/8	/99	4/7	7/99	4/7	7/99	4/	7/99	4/	8/99	4/	7/99	4/7	/99	4/8	3/99	4/8	3/99	4/8	799	4/	8/99	4/	8/99
			MCL (3) or					Upgradi	ent Well	5														1		$\overline{}$	
	PQL (1)	HBN (2)	RBC (4)	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filterec	Total	Filtered	Total	Filtered
Metals										1			i T		i		1				i —		1	T	i		i
(micrograms per liter (µg/L))			1						1	1	1		1	1		1	1			1			i		1		1
Antimony	30	5	6	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<5	<0.4	<	<0.4	<5	<0.4	<5	<0.4	<5
Arsenic	10	50	50	1.9 B	< 5	<1.8	<5	2.7 B	<5	<1.8	< 5	<1.8	<5	2.0 E	<5	24.7	22	3.4	<5	<1.8	<5	2.3 B	<5	<1.8	<5	<1.8	<5
Barium	20	2,000	2,000	72.8	500	38.9	570	174	730	102	640	33.5	280	288	1100	561	690	161	660	147	180	99.8	120	192	960	0.4	19
Beryllium	3	1	4	0.6	< 3	<0.3	3	<0.3	⋖	<0.3	< 3	10.1	11	<0.3 B	3	0.3 E	3 3	<0.3	< 3	<0.3	ব	<0.3	<3	<0.3	3	<0.6	⋖
Cadmium	1	5	5	<0.6	<1	<0.6	<1	<0.6	<1	1.6 B	<1 □	2.5	3	<0.6	<1	<0.6	<1	2.3	2	1.5 B	1	<0.6	<1	1.1 E	1	<0.6	1
Chromium	10	100	100	9.7 B	5	3.3 B	<5	<0.3	6	<5.0	<5	7.3 B	<5	10.6 B	7	1.9 E	₹ <5	<1.7	<5	<1.7	<	<1.7	<	1.7 E	<5	3.0	<5
Lead	10	5	15 (6)	5.3 L	<5	<0.3 L	<5	1.7 L	<5	7.7	<5	7.2	< 5	<0.3 L	<5	1.6 I	. <5	2.4 L	<5	2.1 L	<	1.1 L	<5	1.4 L	<5	<0.3	<5
Mercury	2	2	2	<0.6 L	<2	<0.6 L	<2	<0.6 L	<2	<0.6 L	< 2	<0.6 L	<2	<0.6 L	⋖	<0.6 I	. <2	<0.6 L	<2	<0.6 L	<2	<0.6 L	<2	<0.6 L	<2	<0.6	<2
Nickel	20	100	730	25.0	25	6.7	<5	37.7	39	43.9	14	230	260	30.5	26	57.5	57	41.7	39	29.2	29	16.7	15	64.3	56	0.9	ও
Selenium	20	50	50	9.3 B	<5	<4.0	<5	5.2 B	8	5.2 8	<5	59.5	64	13.5 B	В	5.1 E	₹ <5	13.8 B	13	<4.0	<	4.3 B	<5	4.3 E	7	<4.0	<
Silver	2	50	180	<0.2	<2	<0.2	<2	<0.2 L	<2	<0.2 L	<2	<0.2 L	<2	<0.2	<2	<0.2 L	. <2	<0.2 L	<2	<0.2 L	<2	<0.2 L	<2	<0.2 I	. <2	<0.2	1 2
Thallium	10	1	2	1.0 B	<5	<0.3 L	<5	1.8 B	<5	0.9 B	<5	3.0 B	<5	<0.3 L	<5	1.4 B	s∣<5	0.9 B	<5	0.7 B	<5	2.7 B	<5	1.4 E	<5	0.4	⋖5
Vanadium	80	200	260	8.2 B	<5	<0.5	<5	<0.5	<5	2.3 B	<5	7.7	<5	<0.5	<5	<0.5	<5	0.5 B	<5	<0.5	<5	<0.5	<5	<0.5	<5	0.6	<5
Zinc	20	7,000	11,000	12.2 B	200	10.4	170	15.1	180	29.2	100	511	710	9.9	200	40.1	20	15.6 B	350	9.2 B	12	29.8 B	32	15.2 E	300	7.8	6
Polychlorinated Biphenyls (µg/L)	0.7	0.5	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA		NA		NA	NA	NA		NA
Aroclor 1016				-	-		_			-	-				-	<5		-	-	<5	-	<5	-	-		<5	-
Aroclor 1221				-	-	l -	-	-	-	-	·-	۱ -	-	-	-	<5	-	-	-	<	-	<5	-	-	-	<	-
Aroclor 1232				-	-	-	-	-	-	- 1	-	-	-	_		<5	-	-		<5	١ -	<5	-	۱ -	} -	<5	-
Aroclor 1242	1			-	-	-	-	-	-	-	-	-	-	-	.	<5	-		-	<5	-	<5	-	١ -	-	 < 5	-
Aroclor 1248				-	-	- 1	-	-	-	-	-	-	-	-	- 1	<5	-	-	-	<	-	<5	-	۱ -	-	<	-
Aroclor 1254				-	-	-	- 1	-	-	-	-	-	-	-	-	<5	-	-	-	<5	-	<5	-	1 -	} -	<5	-
Aroclor 1260				-	-	-	-	-	-	-	-	-	-	-	-	<5	-	-	-	<5	-	<5	-	-	-	<5	-
Total Suspended Solids (µg/L)	_	-		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	72000	NA	NA	NA	23000	NA	17000	NA	NA	NA		NA
Methane in Water (µg/L,5)	5 Notes			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4000	NA	NA	NA	180	NA	16	NA	NA	NA	NA	NA

Notes:

Total metal results were validated. Filtered metal results were not validated.

PCB results were validated. TSS and methane validated using reduced laboratory deliverable.

- < Indicates that the analyte was not detected at that quantitation level.
- B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.
- L This result should be considered a biased low quantitative estimate.
- J- This result should be considered a quantitative estimate.
- NA Not analyzed
- ppq parts per quadrillion.
- 1 RCRA Corrective Action Permit-specified Practical Quantitation Limit.
- 2 RCRA Corrective Action Permit-specified Health Based Number.
- 3 Maximum Contaminant Level for antimony, arsenic, barium, beryllium, cadmium, chromium, mercury, selenium, and thallium. EPA Region III Risk-Based Concentrations for tap water, 12 April 1999, for remaining analytes.
- 4 RBC for PCB varies for aroclor. The lowest RBC is 0.033 micrograms per liter.
- 5 The quantitation limit for methane is not specified by the RCRA Corrective Action Permit.
- 6 The EPA suggested action level at the tap for lead.
- 7 EB-1 is equipment blank.
- 8 PW-1R and PW-12R are replacement wells for PW-1 and PW-12.

Table 4 Dioxin Results Paint Branch Landfill Areas and Metzerott Road Landfill University of Maryland, College Park, Maryland

Monitoring Well ID		MW-8	MW-8D (2)	PW-7,9,13	EB-1 (4)		PW-9	PW-13	PW-13D (2)	EB-1 (4)
Date Sampled		4/6/99	4/6/99	4/7,8/99	4/8/99	3/16/00	3/16/00	3/16/00	3/16/00	3/16/00
	TDL (1)									
Polychlorinated Dibenzo-p-Dioxins and Debenzofurans (ppq, 2,3)	10 ppq				ND					
1,2,3,4,6,7,8-HpCDD 1,2,3,4,6,7,8-POCDD 1,2,3,4,6,7,8-POCDF 1,2,3,4,8-HxCDF 1,2,3,7,8-HxCDD 1,2,3,7,8-PkCDD 1,2,3,7,8-PkCDF 1,2,3,6,7,8-HxCDF		145 2870 23.0 J 799 J	136 3070 28.2	8.6 J 284 3.5 J 35.3 J		22.5 I	3 14.5 B 5.5 B 3 1.5 B	2.9 J 8.1 B	28.3 B	5.7 J

Notes:

Blank indicates not detected.

- <- Indicates that the analyte was not detected at that quantitation level.

 B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.
- J- This result should be considered as a quantitative estimate.

- ppq parts per quadrillion.

 (1)- The quantitation limit (Target Detection Limit or TDL) for dioxin is 10 ppq, and was not specified in the RCRA Corrective Action Permit.

 (2) Duplicate samples for MW-8 and PW-13.
- (3) The MCL for 2,3,7,8-TCDD or TEQs is 30 ppq.
 (4) Equipment rinseate blanks.

Table 5 Summary of TEQs for Paint Branch Landfill Areas and the Metzerott Road Landfill University of Maryland, College Park

Monitoring Well ID					N	IW-8	MW-	8D (7)	PW-7, 9,	13 COMP
Analytes (1)	TDL	HBN (3)	MCL	TEF (2)	Result	TEQ (5)	Result	TEQ	Result	TEQ
Dioxin (ppq)	10	None	30							
2,3,7,8-TCDD		-	30	1	ND		ND		ND	
1,2,3,7,8,9-HxCDD				0.1	ND		ND		ND	
1,2,3,4,6,7,8-HpCDD	-		-	0.01	145	1.45	136	1.36	8.6 J	0.086
1,2,3,4,6,7,8,9-OCDD	_			0.001	2870	2.87	3070	3.07	284	0.284
1,2,3,4,7,8-HxCDF	-	-	-	0.1	ND	***	ND		ND	
1,2,3,4,6,7,8-HpCDF	-		-	0.01	23 J	0.23	28.2 J	0.282	3.5 J	0.035
1,2,3,4,7,8,9-HpCDF		-		0.01	ND		ND		ND	
1,2,3,7,8-PeCDF				0.05	ND		ND		ND	
1,2,3,4,6,7,8,9-OCDF				0.001	<i>7</i> 99 J	0.799	ND		35.3 J	0.0353
									1	
		Í								
ļ										
Total TEQs						5.349		4.712		0.4403

Notes: ppq is parts per quadrillion.

ND indicates that data validation determined that the analyte was not present.

PW-7, 9, 13 COMP is a composite sample from these three monitoring wells.

- (1) All samples collected by low flow sampling method, and not field filtered.
- (2) Toxicity Equivalency Factors relative to 2,3,7,8-TCDD.
- (3) RCRA Corrective Action Permit-specified Health Based Number.
- (4) Maximum Contaminant Level for dixoin.
- (5) Toxic Equivalency (which is the Toxicity Equivalency Factor times concentration).
- (6) The quantitation limit for dioxin is 10 parts per quadrillion, and was not specified the RCRA Corrective Action Permit.
- (7) Duplicate samples for MW-8 and PW-13.
- --- Not Applicable
- J Quantitiative estimate.
- B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.

Table 5 Summary of TEQs for Paint Branch Landfill Areas and the Metzerott Road Landfill University of Maryland, College Park (continued)

Monitoring Well ID		Pi	N-7			PW-9			PW-13	3
Analytes (1)	TEF (2)	Result		TEQ (5)	Result		TEQ (5)	Result		TEQ (5)
Dioxin (ppq)	-									
2378-TCDD	1	ND			ND			ND		
12378-PeCDD	0.5	ND			ND			ND		
123478-HxCDD	0.1	ND			ND			ND		
123678-HxCDD	0.1	ND			ND			ND		
123789-HxCDD	0.1	ND			ND			2.3	J	0.23
1234678-HpCDD	0.01	ND			ND			ND		
12346789-OCDD	0.001	22.5	В		14.5	В		29.7	В	
2378-TCDF	0.1	ND			ND			ND		
12378-PeCDF	0.05	ND			ND			3.0	J	0.15
23478-PeCDF	0.5	ND			ND			ND		
123478-HxCDF	0.1	1.5	В		1.5	В		2.7	В	
123678-HxCDF	0.1	ND			ND			2.1	J	0.21
234678-HxCDF	0.1	ND	- 1		ND			ND		
123789-HxCDF	0.1	ND			ND			ND		
1234678-HpCDF	0.01	ND			ND			2.9	J	0.029
1234789-HpCDF	0.01	ND			ND			ND		
12346789-OCDF	0.001	ND			5.5	В		8.1	В	
Total TEQs										0.619

Notes: ppq is parts per quadrillion.

ND indicates that data validation determined that the analyte was not present.

PW-7, 9, 13 COMP is a composite sample from these three monitoring wells.

- (1) All samples collected by low flow sampling method, and not field filtered.
- (2) Toxicity Equivalency Factors relative to 2,3,7,8-TCDD.
- (3) RCRA Corrective Action Permit-specified Health Based Number.
- (4) Maximum Contaminant Level for dixoin.
- (5) Toxic Equivalency (which is the Toxicity Equivalency Factor times concentration).
- (6) The quantitation limit for dioxin is 10 parts per quadrillion, and was not specified the RCRA Corrective Action Permit.
- (7) Duplicate samples for MW-8 and PW-13.
- Not Applicable
- J Quantitiative estimate.
- B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.

Table 5 Summary of TEQs for Paint Branch Landfill Areas and the Metzerott Road Landfill University of Maryland, College Park (continued)

Monitoring Well ID		PV	V-13D	(7)
Analytes (1)	TEF (2)	Result		TEQ (5)
Dioxin (ppq)				_
2378-TCDD	1	ND		-
12378-PeCDD	0.5	ND		
123478-HxCDD	0.1	ND		
123678-HxCDD	0.1	ND		
123789-HxCDD	0.1	ND		·
1234678-HpCDD	0.01	ND		
12346789-OCDD	0.001	28.3	В	
2378-TCDF	0.1	ND		
12378-PeCDF	0.05	ND		
23478-PeCDF	0.5	ND		
123478-HxCDF	0.1	2.5	В	
123678-HxCDF	0.1	ND		
234678-HxCDF	0.1	ND		
123789-HxCDF	0.1	ND		
1234678-HpCDF	0.01	ND		
1234789-H _P CDF	0.01	ND		
12346789-OCDF	0.001	ND		
Total TEQs				

Notes: ppq is parts per quadrillion.

ND indicates that data validation determined that the analyte was not present.

PW-7, 9, 13 COMP is a composite sample from these three monitoring wells.

- (1) All samples collected by low flow sampling method, and not field filtered.
- (2) Toxicity Equivalency Factors relative to 2,3,7,8-TCDD.
- (3) RCRA Corrective Action Permit-specified Health Based Number.
- (4) Maximum Contaminant Level for dixoin.
- (5) Toxic Equivalency (which is the Toxicity Equivalency Factor times concentration).
- (6) The quantitation limit for dioxin is 10 parts per quadrillion, and was not specified the RCRA Corrective Action Permit.
- (7) Duplicate samples for MW-8 and PW-13.
- -- Not Applicable
- J Quantitiative estimate.
- B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.

Table 6
Monitoring Well Headspace Measurements on 7 March 2000
Metzerott Raod and Paint Branch Landfills, College Park, Maryland

Monitoring Well ID	OVA	(ppm)	% LE	L (ppm)
	Initial	Sustained	Initial	Sustained
Metzerott Road Landfill				
MW-1	0	0	1	0
MW-2	> 100	10	15	10
MW-3	0	0.	1	1
MW-4				
MW-5	0	0	. 0	0
MW-6	0	0	0	0
MW-7	0	0	2	1
MW-8	> 1000	> 1000	45	45
Paint Branch Landfill Areas				
PW-1	3	3	31	28
PW-4	3	3	2	2
PW-5	0	0	0	0
PW-7	10	10	1	1
PW-8	1	1	3	1
PW-9	0	0	0	0
PW-10	100	100	3	7
PW-11	0	0	1	1
PW-12R	0	0	6 .	4
PW-13	0	0	2	2
PW-14	0	0	2	2

Notes:

All results are values above background.

OVA - organic vapor analyzer

% LEL - percentage of the lower explosive limit for combustible gases ppm - parts per million

Initial readings were taken immediately upon removing well cap; sustained readings were recorded after concentration had stabilized for 1-3 minutes MW-4 is artesian.

Table 7
Ground Water Temperature and pH Measurements at PW-12R on 16 March 2000
Paint Branch Landfill, College Park, Maryland

Time	DTW (ft)	Temp (°C)	pН
11:00	8.12	20.64	3.53
11:03	9.02	20.69	3.48
11:06	8.92	20.78	3.47
11:09	8.99	20.92	3.48
11:12	9.92	21.14	3.47
11:15	9.92	21.23	3.47
11:18	9.92	21.34	3.46
11:21	9.92	21.42	3.45
11:24	9.92	21.39	3.45
11:27	9.92	21.40	3.45
11:30	9.92	21.40	3.45

Notes:

 $\label{lem:measurements} \mbox{Measurements collected using low flow sampling method.}$

DTW is depth to water.

Table 8 Ground Water Results for Metals, PCBs, Methane and TSS Metzerott Road Landfill

University of Maryland, College Park, Maryland

Monitoring Well ID				M	N-1	M	W-5	MV	N-6	MV	V-2	M	W-3	M	W-4	M	N-7		W-8	MW-	8D (5)	MW-8	Rep. (6)
Date Sampled				4/5	/99	4/	5/99	4/5	799	4/5	/99	4/5	5/99		/99	4/5	/99	4/6	99	4/6	/99		
			MCL (3) or											ient Wel									
	PQL (1)	HBN (2)	RBC (4)	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtere	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered	Total	Filtered
Metals (micrograms per liter (µg/L))													1		1				1		1		1
Antimony	30	5	6	<0.4	<5	<0.4	5	<0.4	6	<0.4	<5	0.9	5	<0.4	<5	<0.4	<5	<0.8	<10	<0.8	<10	<0.8	<10
Arsenic	10	50	50	<1.8	<5	4.2	<5	<1.8	<5	8.2	8	2.2 B	<5	2.3 B	<5	<1.8	<5	9.2	10	10.8	12	11.4	<10
Barium	20	2,000	2,000	194	660	33.5	530	42.6	500	121	500	191	820	130	280	49.3	510	292	500	312	440	294	300
Beryllium	3	1	4	1.5	<3	13.2	13	<0.3	<3	0.7	<3	2.2	<3	1.2	<3	0.3 B	<3	0.6 T	3 <6	0.8 B	<6	0.6 E	<6
Cadmium	1	5	5	<0.6	<1	2.7	3	0.6 B	1	4.7	5	9.3	12	0.6 B	1	<0.6	<1	1.6 E	3 <2	2.6	<2	1.8 E	<2
Chromium	10	100	100	4.0 B	<5	3.1 B	<5	4.2 B	<5	2.7 B	<5	5.0 B	<5	3.2 B	<5	4.3 B	<5	109	230	155	120	129	160
Lead	10	5	15 (7)	24 L	<5	3.0 L	<5	<0.3 L	. <5	2.6 L	<5	4.9 L	<5	0.5 L	<5	<0.3 L	<5	<0.6 I	<10	1.0 L	<10	1.6 L	<10
Mercury	2	2	2	<0.6 L	<2	<0.6 L	<2	<0.6 L	. <2	0.6 L	<2	5.0	4	1.2	<2	<0.6 L	<2	<0.6 1	<2	<0.6 L	<2	<0.6 L	<2
Nickel	20	100	730	57.7	44	290	290	28.4	27	195	210	151	160	61.6	60	21.4	17	109	100	122	100	104	110
Selenium	20	50	50	7.9 B	<5	30.8	30	5.7 B	<5	32.6	32	29.8	30	12.8 B	9	9.8 B	11	49.2	54	62.8	56	51.0	52
Silver	2	50	180	<0.2	<2	<0.2	<2	<0.2	<2	<0.2	<2	<0.2	<2	<0.2	~2	<0.2	<2	<0.4	<4	<0.4	<4	<0.4	<4
Thallium	10	1	2	0.6 L	<5	0.9 L	<5	1.1 L	<5	5.3 L	10	2.8 L	<5	1.3 L	<5	0.5 L	<5	1.6 E	<10	1.8 B	<10	2.0 B	<10
Vanadium	80	200	260	0.5	<5	8.6 B	<5	1.9 B	<5	7.0 B	6	1.9 B	<5	1.0 B	<5	1.1 B	<5	31.4	60	43.6	32	36.2	42
Zinc	20	7,000	11,000	140	300	3,175	3,300	51.5	220	450	620	393	610	164	210	85.0	180	11.0	40	12.6	38	16.6	12
Polychlorinated Biphenyls (µg/L)	0.7	0.5	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA		NA	NA	NA
Aroclor 1016					_	_												45				1	1 1
Aroclor 1221	1			_		-	-	-	[-	-	-	-	-	-	-	-	<5	-	<5	-	-	-
Aroclor 1232		-		-	- 1	-		-		·	-	-	-	_	-	-	.	<5	-	<5	-	1 -	-
Aroclor 1242	.			_	-	-					-	_	i - I		-	-	-	<5 <5	-	<5 <5	-	1 -	-
Aroclor 1248	1			.	. 1	- 1		-	[-	-	[-		-	-	<5	-	<5	-	-	1 - 1
Aroclor 1254	ł		i	_		_		-			-	-	[- 1		- 1	<i>5</i>	1 - 1	<5	-		-
Aroclor 1260					_	_	_	-	-	-	_	.			_ [-		<5	[]	<i>√</i> 5		-	
	-															_		~		~]	_	-
Total Suspended Solids (µg/L)	-	-	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	88000	NA	NA	NA	NA	NA
Methane in Water (µg/L, 6)	5			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7900	NA	8400	NA	NA	NA

Notes:

Total metal results were validated. Filtered metal results were not validated.

PCB results were validated. TSS and methane validated using reduced laboratory deliverable.

- <- Indicates that the analyte was not detected at that quantitation level.
- B This result is qualitatively invalid since this compound/analyte was detected in a blank at a similar concentration.
- L This result should be considered a biased low quantitative estimate.
- J- This result should be considered as a quantitative estimate.

NA - Not analyzed

ppq is parts per quadrillion.

- 1 RCRA Corrective Action Permit-specified Practical Quantitation Limit.
- 2 RCRA Corrective Action Permit-specified Health Based Number.
- 3 Maximum Contaminant Level for antimony, arsenic, barium, beryllium, cadmium, chromium, mercury, selenium, and thallium. EPA Region III Risk-Based Concentrations for tap water, 12 April 1999, for remaining analytes.
- 4 RBC for PCB varies for aroclor. The lowest RBC is 0.033 micrograms per liter.
- 5 Duplicate and replicate samples for MW-8.
- 6 The quantitation limit for methane is not specified by the RCRA Corrective Action Permit.
- 7 The EPA suggested action level at the tap for lead.

Table 9 Calculated Dilution Factors for Paint Branch

Flow Scenario	Q _{r(1)} (cubic feet per second, cfs)	Q _{gw(2)} (cfs)	DF	Projected Concentration in Paint Branch (TEQs) ⁽³⁾
Average	35.8	0.096	370	0.0012 - 0.0017 ppq
Median	19.7	0.096	204	0.002 – 0.003 ppq
Drought	2.35	0.096	24	0.018 - 0.026 ppq

- (1) Data from USGS stream gage (01649500), indicates that the average discharge is 1.16 cubic cfs/mi²; median flow is 0.65 cfs/mi²; drought or 7Q10 flow is 0.77 cfs/mi².
- (2) Ground water flow calculated from Darcy's equation using average hydraulic conductivity data from R&R's Report, excluding the two lowest values for conservatism; hydraulic gradient of 0.02 from 19 April 1999 ground water data; and cross section 2,700 feet long and 15 feet thick from well screen depths. Figure 5 shows the cross section for ground water discharge into Paint Branch.
- (3) The TEQ values were calculated by dividing the results for the PW-7, 9, 13 COMP (TEQ of 0.4403 ppq) and the PW-13 (0.619 ppq) grab samples by the dilution factors.

APPENDIX A

CORRESPONDENCE WITH EPA



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION III 1650 Arch Street Philadelphia, Pennsylvania 19103-2029

February 1, 2000

In Reply Refer to: 3WC23

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Leon Igras
University of Maryland
Department of Environmental Safety
7505 Yale Avenue
College Park, Maryland 20742-6511

Dear Mr. Igras:

As requested, please find enclosed a copy of the draft EPA guidance on Institutional Controls. As the April 13, 1998 cover memorandum indicates, the manual is not intended to be agency guidance, but is intended to provided useful information concerning the implementation of institutional controls. If you have any questions, please do not hesitate in contact me at 215-814-3434.

Also, EPA approves your response to EPA comments dated November 12, 1999. Please advise me and Stephen Markowski from the Maryland Department of the Environment at least fourteen (14) days in advance of beginning of field activities at University of Maryland.

Sincerely,

Wanda Martinez, Project Manage

General Operations Branch

Enclosure

cc: Steph

Stephen Markowski, MDE



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION III 1650 Arch Street Philadelphia, Pennsylvania 19103-2029

October 21, 1999

In Reply Refer to: 3WC23

CERTIFIED MAIL RETURN RECEIPT REQUESTED

Mr. Leon Igras
University of Maryland
Department of Environmental Safety
7505 Yale Avenue
College Park, Maryland 20742-6511

Dear Mr. Igras:

The Environmental Protection Agency (EPA) has reviewed the Interim RFI Addendum Report for the Paint Branch Road Landfill Areas and the Metzerott Road landfill dated August 3, 1999. Please find below EPA comments.

- 1. Based on the field data and the data in Table 1 of the report, there are some discrepancies between total depth and depth to bottom of the wells. Please see Attachment 1. Please review these discrepancies and correct or provide an explanation for theses discrepancies.
- 2. By comparison of Table 3 and Table 2A of Appendix B and Table 5 and Table 2B, analytical results of filtered samples for some metals are higher than the non-filtered samples. This information needs to be identified in the report and an explanation must be provided. The highest concentration should be use for comparison to Health Based Numbers (HBNs), Risk based Numbers (RBCs) or Maximun Concentration Levels (MCLs).
- 3. Field notes revealed that groundwater temperatures measured from monitoring well PW-12R are unusually high. Also the pH is very low and the turbidity is very high. Data from this well may not be representative of groundwater conditions. Groundwater temperature and pH measurements should be taking again from monitoring well PW-12R to verify current conditions.
- 4. Dioxins were detected in the composite sample of wells PW-7, PW-9 and PW-13. EPA requests monitoring of dioxins in these areas to verify that levels of dioxins do not represent a risk to human health and the environment. Individual samples should be taken from each well and analyzed for dioxins. Individual samples results are requested in order to identify possible source areas of dioxin if present at the site. Once a source area is identified corrective measures may be implemented, ie., additional monitoring, stringent institutional controls, etc.

Customer Service Hotline: 1-800-438-2474

- 5. Methane was detected in groundwater. Organic vapor Analyzer (OVA) reading measurements should be taking from each monitoring well at Metzerott Landfill and at the Paint Branch Landfill to determine possible areas where methane is being generated. EPA approves University of Maryland (UMD) recommendation of implementing a monitoring program for methane. Please submit a detailed plan for this monitoring program.
- 6. Levels of metals above the MCLs were detected in some wells at the Metzerott Landfill. EPA found that these concentrations do not represent at current risk to human health and the environment. UMD must include institutional controls as part of the corrective measures for this area. Institutional controls should include, but not be limited to, posting of signs, deed notations, survey plat, etc. Institutional controls should also be part of the further actions for the Paint Branch Landfills areas. UMD must notify EPA in the event that current land use or groundwater use change at the site. This notification is required as soon as UMD becomes aware of the changes.
- 7. The following statement in page 4 of the report: "Since groundwater is not a current or future source of potable water at or within one square mile radius..., the HBNs, RBCs and MCLs presented in Table 3 are presented solely as a point of reference, and are not meant to imply that they are applicable standards for groundwater at the site" is not appropriate. MCLs are applicable cleanup standards for Region III RCRA Program for potentially usable aquifers.

Please submit a revised RFI Addendum Report, based on the comments presented above, within 30 days of receipt of this letter. If you have any questions, please contact me at 215-814-3434.

Sincerely,

Wanda Martinez

General Operations Branch

cc: C.K. Lee, EPA
Samuel Rotenberg, EPA
Stephen Markowski, MDE
Scott Lupin, UMD
Leonard Rafalko, ERM

ATTACHMENT 1

WELL	TOTAL DEPTH (FT)	DEPTH TO BOTTOM (FT)	DIFFERENCE (FT)
MW-2	19	17.91	1.09
MW-3	14	18.3	-4.3
MW-4	14	20	-6.0
MW-6	35	28.95	-6.05
PW-4	35	34	1
PW-5	18.5	21	-2.5
PW-7	27	27.5	-0.5
PW-8	19	22.11	-3.11
PW-9	17	19.5	-2.5
PW-10	23	26.5	-3.5
PW-12R	22	21.2	0.8
PW-13	17	20	-3.0
PW-14	15	17.7	-2.7

Environmental Resources Management

2666 Riva Road, Suite 200 Annapolis, MD 21401 (410) 266-0006 (410) 266-8912 (fax) http://www.erm.com

ERM.

12 November 1999 Reference: M6101.00.01 Sent by Fax (215-814-3113) and US Mail

Ms. Wanda Martinez
General Operations Branch
United States Environmental Protection Agency Region III
1650 Arch Street, 3WC23
Philadelphia, PA 19103-2029

Re: EPA's 21 October 1999 Letter with Comments to the Interim RFI Addendum Report for the Paint Branch Road Landfill Areas and the Metzerott Road Landfill, University of Maryland, College Park, Maryland, RCRA Corrective Action Permit MDD 980829873,

Dear Ms. Martinez:

On behalf of the University of Maryland (UM), Environmental Resources Management (ERM) has prepared this letter in response to the referenced letter from the United States Environmental Protection Agency (EPA). The responses to EPA's comments are enumerated below following the order in which they were presented by the EPA. Note that the responses reference our telephone conversation on 26 October 1999, during which we reviewed EPA's comments and agreed to the courses of action described below.

- Response to EPA Comment No. 1. ERM will sound the monitoring wells to confirm total well depths. This information will be provided in the final RFI addendum report.
- Response to EPA Comment No. 2. ERM will reiterate in the final RFI addendum report that there were some apparent discrepancies between the total and filtered metals results, and provide a possible explanation(s). Furthermore, as requested by the EPA, the highest concentration between the total and filtered metals results will be used for comparison to the Permit-specified Health Based Numbers (HBNs), EPA Region III Risk Based Concentrations (RBCs) or Maximum Contaminant Levels (MCLs).
- Response to EPA Comment No. 3. ERM will resample monitoring well PW-12R to measure ground water temperature and pH.

Response to EPA Comment No. 4. ERM will collect individual ground water samples from PW-7, PW-9 and PW-13. Each sample will be



Ms. W. Martinez M6106.00.01 12 November 1999

> submitted for dioxin analyses. As approved by you during our telephone conversation on 28 October 1999, quality control samples will consist of one blind duplicate sample, and one equipment rinseate blank. Data validation is not required by the EPA.

- Response to EPA Comment No. 5. During sounding of each monitoring well (see response to EPA comment No. 1), ERM will use an organic vapor analyzer (OVA) to measure the head space in each well for organic vapors, potentially indicative of methane. The results will be provided in the final RFI addendum report, which will also include a copy of UM's monitoring plan for methane at the landfills.
- Response to EPA Comment No. 6. The final RFI addendum report will identify appropriate institutional controls (e.g., posting of signs, deed notations) at the landfills, including notification to the EPA of land use or ground water use changes. ERM requests that the EPA provide or identify a guidance document of potential institutional controls.
- Response to EPA Comment No. 7. As we agreed, ERM will appropriately modify the statement identified by the EPA, and remove the word "applicable."

As you and I agreed on 26 October 1999, the RFI addendum report will be submitted within a 90 to 120 day time period from today. This time period is necessary for UM to complete its procurement process to fund the work and contracting procedures with ERM, and for laboratory turnaround of the dioxin analyses, which previously required about 8 weeks. The final RFI addendum report will be provided to the EPA on or about 13 March 1999.

Please feel free to call me at 410-266-0006 or Mr. Scott Lupin at 301-405-3968 if you have any questions or require clarification. Have a great day.

Sincerely,

Leonard G. Rafalko Project Manager



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION III 1850 Arch Street Philadelphia, Pennsylvania 19103-2029

February 13, 2001

In Reply Refer to: 3WC23

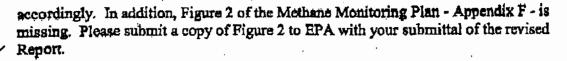
CERTIFIED MAIL RETURN RECEIPT REQUESTED

Mr. Leon Igras University of Maryland Department of Environmental Safety 7505 Yale Avenue College Park, Maryland 20742-6511

Dear Mr. Igras:

The U.S. Environmental Protection Agency (EPA) has reviewed University of Maryland's (UMD) RFI Addendum Report for the Paint Branch Road Landfill Areas and the Metzerrott Landfill dated June 8, 2000 (the Report). Below are EPA's comments and revisions to the Report:

- EPA agrees with the conclusion that the concentrations of dioxins found in the samples show no current human health concern and no action beyond institutional controls is needed.
- Monitoring well PW-12R is a designated upgradient well. It was confirmed that 2. abnormalities existed at this well, specifically, the water had a low pH and high temperature. UMD needs to identify the source contributing to these abnormalities and demonstrate that no additional source exists upgradient of PW-12R. EPA recommends that UMD review the power plant operation(s) which is located near PW-12R. As you know, acids are commonly used at power plants to clean boiler tubes, cooling towers and condensation tubes. Provide a summary of your review within 30 days of receipt of this letter. In addition, please delete the last sentence of the second paragraph on page 14 of the Report.
- 3. EPA does not concur with the conclusion that no methane problem exists. Groundwater sample results and air sample results showed detectable levels of methane. As a corrective measure, EPA agrees that UMD must implement a routine monitoring program for inspecting subgrade structures in and around the landfills, as proposed, for potentially unacceptable levels of methane. Please revise your conclusions and recommendations



Please revise the last sentence of section 3.1.2 of the Report. As noted previously, MCLs are not just a point of reference, but the clean up goal for groundwater.

ENVIROAFFAIRQ

- Please describe any procedures UMD has in place to prevent exposure of contaminants from the landfills areas, i.e. notification to the environmental department before disturbance of land on campus, use of air monitoring devices, etc.
- **8**. Please revise section 6.0 by deleting the overstatement and speculations which should not 🥕 🤔 be part of the conclusions.
- EPA concurs with your proposal to restrict the use of groundwater at the Property. Unfortunately, a restrictive covenant, as proposed in Appendix G, is not the appropriate instrument by which to restrict subsequent grantees' use of groundwater at or beneath the Property because, to be enforceable, a restrictive covenant requires a grantor and a grantee. At this time, there are no grantees with which to enter into such a covenant.

EPA believes that the appropriate instrument by which to restrict subsequent grantees' use of the groundwater is an easement. Thus, in the event of any future conveyance, assignment or transfer, UMD shall expressly reserve in the deed or other instrument effecting the transfer an irrevocable and permanent easement which grants UMD the exclusive right to use the groundwater at or beneath the Property for drinking purposes. UMD shall enforce the terms of any such easement against all subsequent grantees of an assignment or transfer of Property or an interest in the Property.

In addition, EPA agrees that UMD should file a Notice of Use Restriction providing that groundwater located at or beneath the Property shall not be used for drinking water. The Notice of Use Restriction shall also state that the landfill areas were used as solid waste disposal areas and describe activities that could result in undesirable exposures to the waste/contaminants on the Property or interfere with or adversely affect the landfill areas. UMD shall include in any instrument conveying any interest in any portion of the Property including, but not limited to, deeds, leases and mortgages, a disclosure which is in substantially the following form:

THE INTER	EST CONVEY	ZED HEREB	y is subjec	TTOAN	OTICE
OF USE RES	STRICTION A	ND THE TE	RMS, CONDI	ITIONS A	ND.
RESTRICTION	ONS CONTAI	NED THERE	IN, DATED		THE
NOTICE OF	USE RESTRI	CTION WAS	RECORDED	ON	
	IN THE C	LERK'S OFF	ICE OF THE	CIRCUIT	COURT
OF PRINCE	GEORGE'S	COUNTY, MA	ARYLAND, 1	N BOOK	
PAGE		•			

Please submit to EPA a revised report within 45 days of receipt of this letter in accordance with the comments above. As I am sure you know, the University of Maryland's corrective action permit will expire in November 2001. University of Maryland needs to submit an application to EPA 180 days prior to the expiration date of the permit, for reissuance of the permit. The new permit will include requirements for implementation of the proposed final corrective measures, i.e. methane monitoring program, restrictions on the use of groundwater for drinking water, institutional controls regarding the landfill areas, and EPA's determination of no further action for the other SWMUs identified in the Corrective Action Permit. During the comment period for issuance of the new permit, the public will have the opportunity to review and comment on the previous interim measures performed at the University of Maryland and the proposed corrective measures. If you have any questions, please contact me at 215-814-3434.

Sincerely,

Wanda Martinez, Project Manager

Waste and Chemicals Management Division

Sam Rotenberg, EPA CC: Jack Hwang, EPA

Stephen Markowski, MDE

APPENDIX F

METHANE MONITORING PLAN PREPARED BY THE UNIVERSITY OF MARYLAND DEPARTMENT OF ENVIRONMENTAL SAFETY

METHANE MONITORING PLAN

METHANE MONITORING PLAN

TABLE OF CONTENTS

Section	n			Page
1.0	INTR	ODUO	CTION	1
	1.1	PURP	OSE	1
	1.2	STAT	EMENT OF PROBLEM	1
2.0	MET	HODS	AND PROCEDURES	1
	2.1	SAMP	PLE LOCATIONS AND MONITORING FREQUENCY	1
	2.2	FIELD	HEALTH AND SAFETY PROCEDURES	2
		2.2.1	Personal Protective Equipment	2
		2.2.2	Confined Space Awareness	2
	2.3	MONI	TTORING EQUIPMENT AND FIELD PROCEDURES	2
		2.3.1	Equipment	2
		2.3.2	Equipment Calibration and Maintenance	2
		2.3.3	Field Sampling Procedures	3
		2.3.4	Documentation	3
		2.3.5	Photographs	3
	2.4	QUAI	LITY CONTROL	4
3.0	DAT	A EV	ALUATION	4

1.0 INTRODUCTION

1.1 PURPOSE

The University of Maryland (UM) is currently conducting Resource Conservation and Recovery Act (RCRA) corrective action activities at its College Park, Maryland facility. As a result of sampling activities performed by UM's consultant, Environmental Resources Management, Inc. (ERM), low levels of methane were detected in some subsurface structures located in the former Paint Branch Parkway Landfill Areas 1 and 3. Figure 1 shows the Paint Branch Landfill Areas.

The intent of this Methane Monitoring Plan is to outline how the University plans to monitor the affected areas and respond to levels of methane that could potentially pose a threat to human health and safety.

1.2 STATEMENT OF PROBLEM

Methane is a colorless, odorless gas that is emitted from the biodegrading trash in landfills. Methane is explosive when present in the range of 5 to 15% by volume in air. Subsurface structures such as manholes can be more susceptible to the accumulation of landfill gas. Abovegrade structures are typically not at risk. Subgrade structures in the Paint Branch Landfill Areas may pose a threat to workers who enter these spaces during the course of their duties if methane has accumulated to combustible levels in the presence of sufficient oxygen and an ignition source. Another hazard is suffocation since methane displaces breathable air in confined spaces. According to the OSHA Permit-Required Confined Spaces Standard (29 CFR 1910.146), a hazardous atmosphere exists when the flammable gas is in excess of 10 percent of its lower explosive limit (LEL) or the oxygen concentration is below 19.5 percent or above 23.5 percent.

2.0 METHODS AND PROCEDURES

In order to determine the levels of methane in Paint Branch Landfill subgrade structures, UM will monitor 19 locations for methane twice a yer for one year, then reevaluate the program.

Methods and procedures have been developed for measuring the levels of methane being emitted from subgrade structures, recording the measurements, reporting on the findings, and taking action based on the findings. The methods and procedures are detailed in the following sections.

2.1 SAMPLE LOCATIONS AND MONITORING FREQUENCY

The air will be tested for combustible gas and oxygen content in 19 subgrade structures in the Paint Branch Area 1 and Area 3 Landfills. (See Figure 2 for specific locations.) The air samples will be collected twice a year using a combustible gas meter. At the end of the first year,

the results will be evaluated to determine if the monitoring frequency should be modified. Refer to Appendix A- Field Logbook for a list of sampling locations.

2.2 FIELD HEALTH AND SAFETY PROCEDURES

2.2.1 Personal Protective Equipment

Personal protective equipment will include, as a minimum:

- Safety shoes
- Reflective safety vest (for traffic control) if needed
- Safety glasses
- Abrasion-resistant work gloves for hand protection when needed

2.2.2 Confined Space Awareness

Under no circumstances will entry into a confined space be made. Entry is defined as violating the plane of the opening with any part of the body. If entry should become necessary, the UM Confined Spaces Plan will be followed. (See Appendix B - UM Confined Spaces Plan.)

2.3 MONITORING EQUIPMENT AND FIELD PROCEDURES

2.3.1 Equipment

Methane monitoring will be performed using a MSA Instrument Division Passport Personal Alarm. (See Appendix C - MSA Combustible Gas Meter Instructions.) The alarm uses a low-power, catalytic filament-type sensor for combustible gas detection and displays a digital readout. It is set up to use a sampling pump and probe for use with sampling the subsurface areas. The meter will read percentage of the Lower Explosive Limit (LEL) of combustible gas.

2.3.2 Equipment Calibration and Maintenance

The MSA Passport Personal Alarm will be calibrated in the lab before and at the end of each day's use. The meter range for combustible gas is from 0 to 100% LEL and for oxygen the range is from 0 to 25%. The meter resolution is 1% LEL and 0.1% Oxygen. Calibration consists of the following steps:

- Turn unit on.
- Attach the pump module or calibration cap to the Passport Alarm, orienting the inlet fitting to point toward the battery pack.
- Attach the calibration adapter (P/N 636246) to the calibration cap or pump module.
- Attach the regulator supplied with the calibration kit to the cylinder.
- Connect the black tubing supplied with the calibration kit to the regulator.

- Open the valve on the regulator, and connect the other end of the tubing to the inlet fitting.
- The flow rate of the regulator is 0.25 liters per minute (lpm).
- The readings on the Passport LEL display should be within the limits stated on the calibration cylinder.
- If out of limits, the instrument must be returned to a calibration facility.
- All calibration records will be maintained by UM's Department of Environmental Safety.

2.3.3 Field Sampling Procedures

After the unit is properly calibrated, sampling can commence:

- Arrive at the sample location.
- Turn on Passport.
- When the unit finishes its self check, it is ready for use.
- Lower sampling probe into subsurface space, insuring that the end is not immersed in liquid. Liquid drawn into the Passport will cause damage to the unit.
- Take continuous readings over a 3-5 minute period at a minimum depth of 4 feet. Measure at different heights from the bottom to ensure there are no gas pockets. Record LEL and oxygen readings. Any combustible gas readings which are greater than 10% of the LEL and any oxygen levels below 19.5% or greater than 23.5% will be highlighted for further action. (See Section 3.0 Data Evaluation.)
- Record readings on the Field Logbook form (Appendix A).
- Proceed to next sample location, repeat test.
- The instrument may or may not be turned off between tests.
- Calibrate at end of monitoring to determine instrument drift.
- Sampling records will be maintained at UM's Department of Environmental Safety.

2.3.4 Documentation

The following observations will be made at the beginning of the day:

- Temperature
- Barometric Pressure
- Humidity
- General weather conditions

A log will be dedicated to the Methane Monitoring Plan and will contain all information related to the project, including field notes. (See Appendix A - Field Logbook..) All documentation will be maintained by UM's Department of Environmental Safety.

2.3.5 Photographs

Photographs may be taken with a digital camera when dangerous levels of methane or deficiencies of oxygen are discovered. These photographs may be used in worker training sessions and alert notices.

2.4 Quality Control

When collecting samples for combustible gas readings, any subgrade space covers will be opened just enough to take the sample to minimize the natural ventilation of the space. The reading will be taken at four feet deep or the deepest location to minimize sample dilution.

3.0 DATA EVALUATION

Data collected during the implementation of this plan will be used to assess combustible gas hazards in subgrade structures. If combustible gas levels are above 10% of the LEL or if oxygen levels are below 19>5% or greater than 23.5%, this information will be added to the University of Maryland Confined Space inventory that includes atmospheric hazards. If combustible gas levels are found above 25% or if the oxygen level is less than 18%, the hazard will be considered severe and an alert will be made to all units that may be affected and a warning sign will be placed at the subgrade location. If explosive concentrations of methane are found inside a building, the area will be ventilated and the need for other engineering controls investigated.

At the end of each year of monitoring, the results will be evaluated to determine if the number of sampling locations or frequency of monitoring should be modified. In addition, other aspects of this plan may be modified as conditions warrant.

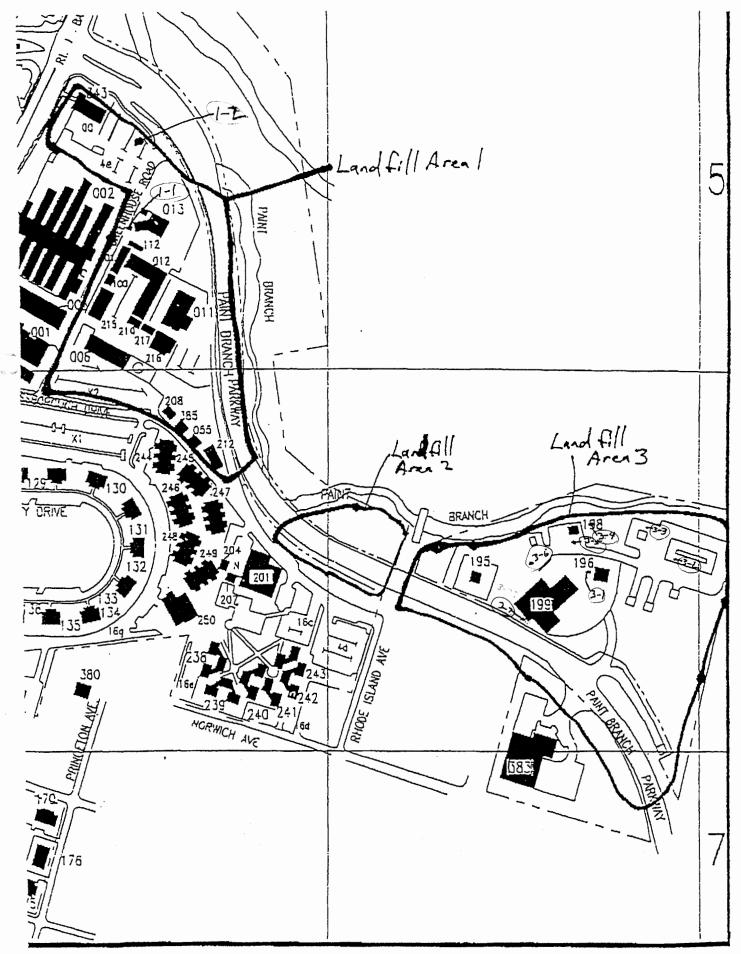
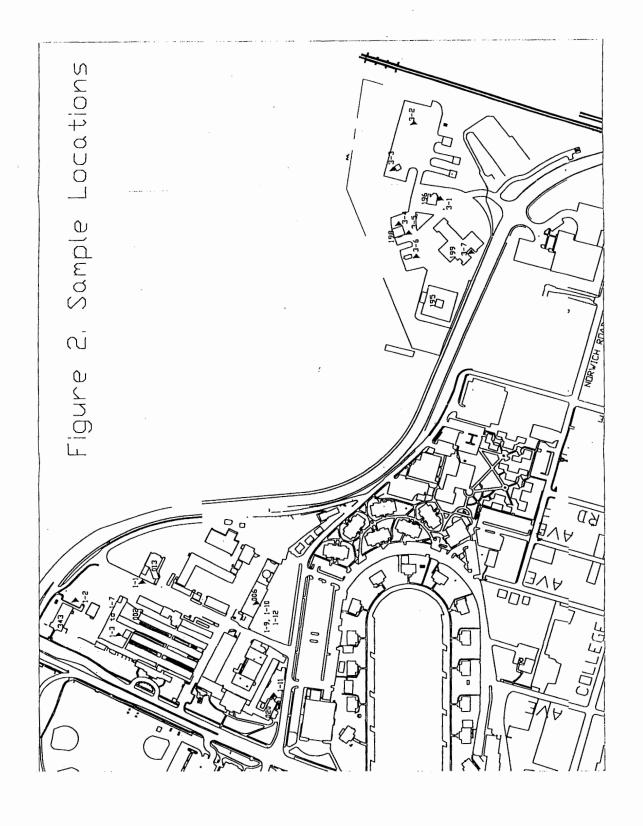
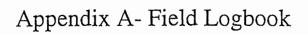


Figure 1





FIELD LOGBOOK

METHANE MONITORING PLAN

University of Maryland, College Park, MD Department of Environmental Safety

DATE:	TEMPERATURE:	BAROMETRIC PRESSURE:
WINDS:	HUMIDITY:	GENERAL:

PERSONNEL TAKING SAMPLES	METER INFORMATION	
	MAKE OF METER:	
	LAST CALIBRATION:	

SAMPLE NO.	LOCATION DESCRIPTION	%LEL	% O2
	Paint Branch Landfill Area 1		
1-1	UM Shuttle Center, Bldg. 013, Storm drain outside fence		
1-2	Mail Center Parking Lot 4E, Utility trench		
1-3	Harrison Green House, Bldg 002, E-3 Floor Drain		
1-4	Harrison Green House, Bldg. 002, West of Rm 1298 Steam Vault		
5	Harrison Green House, Bldg. 002, H3 Sump		
1-6	Harrison Green House, Bldg. 002, Room 1107 Storm Drain		
1-7	Harrison Green House, Bldg. 002, Hole in Basement floor		
1-9	Plant O&M Shops, Bldg. 006, Garage Bay 3, valve box		
10	Plant O&M Shops, Bldg. 006, Garage Bay 3, Floor drain		
1-11	Police Motorcycle Storage Shed Bldg. 020 Outside pump		
1-12	Plant O&M Shops, Bldg. 006, Room 0102, Floor drain		
	Paint Branch Landfill Area 3		
3-1	Burn Building for Fire school, Bldg. 196		
3-2	Burn Building Valve pit manhole	,	
3-3	Fuel Oil Control		
3-4	Storm Drain outside Building 198		į.
3-5	Utility Trench in front of Building 198		
.6	Manhole labled "sanitary" in front of Building 199		
3-7	Manhole between Building 199 and Paint Branch Road		

Comments:			

Appendix B - University of Maryland Confined Spaces Plan



EPARTMENT OF INTONMENT OF INTONMENT OF INTONMENT OF ADMINISTRATIVE AFFAIRS

CONFINED SPACES PLAN

Revised April 2000

Department/Location _____

Review and Approval Authority

Prepared and Edited by:	
Industrial Hygienist	<u>C1-25-96</u> Date
Reviewed and Approved by:	• •
Lell	3-5-96
Director - Environmental Safety	Date
Vice President for Administrative Affairs	3-11-96 Date
Mariel Tallon	3/11/96
Provost	Date
Approved as UMCP Policy:	
QE Cum	3/13/94
President	Date

Table of Contents

(to be completed by the Departmental Designee)
POLICY STATEMENT
GLOSSARY OF TERMS 7
IDENTIFICATION AND CLASSIFICATION OF CONFINED SPACES
POSTING REQUIREMENTS AND SIGNAGE
INFORMATION AND TRAINING
PERMIT-REQUIRED CONFINED SPACE ENTRY 12 Pre-entry Determinations 12 Permit Use 12 Atmospheric Testing 13 Communication 17 Protection of Personnel 18 Ventilation 19 Work In Contaminated Atmospheres 20
NON-PERMIT REQUIRED CONFINED SPACE ENTRY
CONTRACTORS WORKING IN UM,CP PERMIT- REQUIRED CONFINED SPACES
SPECIALIZED WORK
EMERGENCY RESCUE
IIM CONFINED SPACE ENTRY PERMIT Appendix I

POLICY STATEMENT

Approved by the President March 13, 1996 Revised April 2000

A. PURPOSE

This is a statement of official University policy to establish the process for compliance with the Occupational Safety and Health Administration (OSHA) regulation "Permit-Required Confined Spaces", 29 CFR 1910.146. The revision of this policy adopts additional measures required as a result of an amendment to the regulation that became effective February 1, 1999. OSHA requirements regarding underground lines for Telecommunications, 29 CFR 1910.268, have also been incorporated into this policy.

B. SCOPE

The Confined Spaces Plan shall be implemented for all facilities at University of Maryland located in College Park, Maryland (UM,CP) and its satellite locations where there is need to perform any activity within a confined space as defined by Confined Spaces standards and this plan. Employees and students who are authorized to enter a Permit-Required Confined Space must complete Confined Spaces entry training. Authorized employees and students shall not enter any Confined Space until satisfactory air monitoring is completed and appropriate action taken as described in this plan to protect entrants. An attendant must be present and in constant communication with entrants for the duration of any entry. The Confined Space Entry Supervisor must inform the Department of Facilities Management Work Control Center at (301) 405-2222 of the entry date, time, location and purpose of entry prior to entering any Permit-Required Confined Space on UM,CP campus. Required rescue services for all Confined Space entries made on UM,CP campus shall be provided by Prince George's County Fire Department (PGFD). At other locations, the Confined Space Entry Supervisor shall coordinate with local fire and rescue services prior to entry to assure local rescue services are equipped and prepared to provide Confined Space rescue services. Appropriate communication equipment and the local emergency rescue service telephone number shall be supplied to the attendant on duty prior to entry. Where rescue services are not immediately available, no Confined Space entry may be made.

Satellite locations may adopt their own policies for confined space entry when and where it better suits their operational needs. Copies of these policies will be sent to the Department of Environmental Safety, 3115 Chesapeake Building 338, College Park, MD 20742-3113 or electronically to safety@accmail.umd.edu for evaluation.

Contractors operating on UM,CP property are required to comply with all applicable provisions of OSHA/MOSH Confined Spaces regulations. Contractors must notify the Facilities Management Work Control Center at (301) 405-2222 of the entry date,

- (j) Issue alerts to Departmental Confined Space Coordinators of special hazards that have been identified that may impact the safety of entries; and
- (k) Coordinate any Confined Space rescue drills with Prince George's County Fire Department.

2. Department of Facilities Management shall:

- (a) Oversee contracts requiring Confined Space entry;
- (b) Identify requirements for compliance with applicable Confined Space entry regulations and applicable portions of this plan in contract specifications;
- (c) Notify the contractor of the locations of Permit-Required Confined Spaces (as identified by the UM,CP Confined Space inventory) where contractors will require access to inventoried Confined Spaces in order to complete work under the scope of a contract;
- (d) Provide DES with the information necessary to update the confined space inventory when Confined Spaces are created or modified during campus constructions and renovation projects;
- (e) Interface with contractors where enforcement of Confined Space contract provisions is required; and
- (f) Maintain the master log of Confined Space entries at the Work Control Center.

3. Department Heads shall:

- (a) Evaluate or have evaluated, the need for Confined Space entry by employees or students under their control, and if applicable:
 - (1) Designate a Departmental Confined Space Coordinator(s);
 - (2) Distribute the CSP to Coordinators; and
 - (3) Assure that the CSP is received and implemented within the work areas under their review;
- (b) Assure that necessary resources are made available to the Departmental Confined Space Coordinator to allow for compliance with this plan; and
- (c) Assure that new or updated Confined Space inventory information is transmitted to DES for inclusion in the campus inventory.

4. Departmental Confined Space Coordinators shall:

- (a) Implement all provisions of the CSP for work or research areas under their control;
- (b) Inventory and identify all potential Confined Space work areas or facilities under their control;
- (c) Prepare and train personnel to use supplemental Confined Space entry procedures for circumstances not adequately addressed by the campus CSP;

- (h) Coordinate the requirements of a contractor's Confined Space Program with those of this plan when University employees make an entry into a permit space with a contractor; and
- (i) Assure that original entry permits are forwarded to DES upon completion or termination of a Permit-Required Confined Space entry.

6. Confined Space Entrants shall:

- (a) Adhere to the requirements of the CSP and supplemental entry procedures;
- (b) Fulfill all entry team functions as defined by this plan and any procedures created to supplement this plan for specific Confined Space entry;
- (c) Communicate with the attendant regularly while inside of the Confined Space, report any unusual circumstances to the attendant and leave the space immediately when instructed to do so by the attendant;
- (d) Complete all safety training requirements, request further instruction if unclear on any part the training and comply with documentation procedures;
- (e) Report all work place injuries, over-exposure incidents or unsafe conditions to their Confined Space Entry Supervisor as soon as possible; and
- (f) Use appropriate safety and personal protective equipment as provided for entry.

7. Confined Space Entry Attendants shall:

- (a) Adhere to the requirements of the CSP and supplemental entry procedures;
- (b) Remain outside of the Confined Space in constant two-way communication with the entrants until relieved by an alternate attendant or all entrants have exited the space;
- (c) Continuously communicate with the Confined Space entrants and monitor the space to assure that conditions remain within acceptable parameters as defined in the Permit-Required Confined Space Entry section of this plan and instruct entrants to leave a space if any parameter varies from acceptable as defined in the this document;
- (d) Summon rescue personnel in the event of an emergency; and police in the event that an unauthorized person enters the space;
- (e) Complete all safety training requirements, request further instruction if unclear on any of part of the training, and comply with documentation procedures;
- (f) Report all workplace injuries, exposure incidents or unsafe conditions to the Departmental Confined Space Entry Coordinator as soon as possible;
- (g) Perform non-entry rescue procedures if able to do so safely;

GLOSSARY OF TERMS

Attendant: an individual stationed outside of one or more Confined Spaces to monitor the authorized entrants and perform specified duties as described under the Duties and Responsibilities section of this program.

Authorized entrants: an employee who is authorized by the Departmental Confined Space Coordinator to enter a permit-required-confined space.

Confined Space: a space that:

- (a) is large enough and so configured that an employee can enter and perform assigned work; and
- (b) has limited or restricted means for entry or exit; and
- (c) is not designed for continuous employee occupancy.

 (See also, Permit-Required Confined Space and Non-Permit-Required Confined Space.)

Entry: the action by which <u>any part</u> of a person's body passes through an opening into a permit-required Confined Space. Entry includes ensuing work activities in that space.

Entry Permit: the written/printed document that is signed by the entry supervisor to allow and control entry into a regulated Confined Space. The permit contains the information required by regulation. (See the Confined Space Entry Permit in Appendix II of this plan.)

Entry Supervisor: the individual responsible for determining if acceptable entry conditions are present at a permit space where entry is planned.

Hazardous Atmosphere: an atmosphere that may expose employees to the risk of death, injury, impairment of ability to escape unaided, or acute illness from one or more of the following causes:

- (a) Flammable gas, vapor or mist in excess of 10% of its lower flammability limit (LAL);
- (b) Airborne combustible dust at a concentration that meets or exceeds its LAL; (NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet or less);
- (c) Atmospheric oxygen concentration below 19.5% or above 23.5%;
- (d) Atmospheric concentrations of any substance for which a dose, permissible exposure limit (PEL) or threshold limit value (TLV) exists and which could result in employee exposure in excess of its limit; and
- (e) Any other atmospheric condition that is immediately dangerous to life or health.

Hot Work: work within a Confined Space that produces arcs, sparks, flames, heat or other source of ignition. (Contact DES, Fire Safety at (301)405-3970 or http://des.umd.edu/hotworks for information about obtaining a hot works permit.)

Identification and Classification of Confined Spaces

An initial inventory of Confined Spaces located on UM,CP-owned property has been prepared by DES with the cooperation of individual user departments. The inventory shall identify all spaces that meet the definition of a Confined Space and shall further classify each space as Permit-Required Confined Spaces or Non-Permit-Required Confined Spaces. Definitions for these are located in the Glossary of Terms section of this plan.

It shall be the responsibility of Departmental Confined Space Coordinators to update the Confined Space inventory if the use, configuration or condition of a space under their control changes or if new Confined Spaces are identified.

The Departmental Confined Space Coordinator may reclassify a permit-required confined space as a non-permit confined space if the space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space. The permit space may be reclassified as non-permit space as long as the hazards remain eliminated. The Confined Space Coordinator must document the basis for determining that all hazards in a permit space have been eliminated with a certification that contains the date, the location of the space and the signature of the person making the determination.

All information concerning changes to the Confined Spaces Inventory shall be sent to DES via email to safety@accmail.umd.edu or by campus mail to Environmental Safety 3115 Chesapeake Building.

The UM,CP Confined Spaces Inventory database is maintained by DES. The inventory may be viewed online at http://inform.umd.edu/des/os/csp.

Information and Training

All UM,CP personnel who enter Permit-Required Confined Spaces must assume an active role in maintaining a safe working environment by reporting any problems or noncompliance with policies to their Departmental Confined Space Coordinator. All authorized personnel are expected to assist their peers, and should fully utilize any information provided during formal and informal training sessions. Any person who does not understand a policy or procedure should consult their Departmental Confined Space Coordinator, supervisor or DES for clarification.

All personnel entering or attending Confined Spaces shall be provided with information and training regarding the hazards associated with Confined Space entry and the workings of the CSP before being required to enter any Permit-Required Confined Space. Additional training will be provided by the Departmental Confined Space Coordinators when personnel are assigned to a new task for which they have not been trained, or when a new hazard is recognized in the work space.

Training of Confined Space attendants, entrants, supervisors and coordinators in the methods and procedures for standard Permit and Non-Permit-Required Confined Space entry and the provisions of the OSHA Confined Spaces Standard's requirements shall be conducted by a DES-approved training source such as the Maryland Fire and Rescue Institute (MFRI). The Departmental Confined Space Coordinator shall be responsible for training of all authorized entrants in the specific operations, safety equipment, monitoring equipment, emergency procedures, etc. used by the individual department. Contact Environmental Safety at (301)405-3969 to coordinate training for employees at College Park locations. Satellite locations may contact the Special Programs Section of MFRI directly at (301)220-7250 or visit their website at www.mfri.org.

Documentation of CSP training shall be forwarded to DES for recordkeeping. Individual departments may also keep records.

Information regarding the Confined Spaces Program can be found on the Environmental Safety website http://www.inform.umd.edu/des/os/csp. This information includes the University of Maryland Confined Spaces Plan, the inventory of permit-required confined spaces, copies of the Confined Space Entry Permit with instructions, and a link to the OSHA Permit-Required Confined Spaces Standard.

Material Safety Data Sheets (MSDS's) can be obtained by the manufacturer or distributor of the product. Environmental Safety maintains links to MSDS databases at its website www.umd.edu/des in the Occupational Safety Section under Right-To-Know.

overtime, these calculations shall be performed prior to entry and the adjusted permissible exposure limits used during initial space testing.

Revoking Permits

When conditions or work activities are different from those specified on the permit and could introduce a new hazard to the Confined Space, then the permit shall be immediately revoked by the Confined Space Entry Supervisor or Attendant. The Confined Space Entry Supervisor or Attendant shall immediately notify the entry team that the permit is no longer valid. Authorized entrants must immediately leave the space. Reasons for revoking the permit must be recorded on the permit form and returned to DES for use in annual program review.

Changing Work Conditions

A new permit shall be issued or the original permit re-issued whenever changing work conditions or work activities introduce new hazards to the workplace.

Permit Disposition

Expired permits, including permits where entry is aborted, must be retained and forwarded to Environmental Safety. Permits will be retained for a period of one year and will be used in annual program review. It is necessary that a clear explanation of the cause of any permit cancellation be included on the permits prior to submitting them to DES in order to facilitate a complete review of the plan and related entry procedures.

Individual departments may photocopy and retain copies of expired permits if so desired, but are not required to do so.

Attendant

An attendant must be stationed outside any Permit-Required Confined Space prior to posting of the entry permit. The Confined Space Entry Supervisor may assign more than one attendant to an entry if the task poses exceptional risk or if several entrants will be in the space at one time. See the responsibilities section for a description of the attendants duties. (NOTE: Absence of an attendant for any reason shall invalidate the entry permit and entrants must exit the space immediately.)

ATMOSPHERIC TESTING

- a) Before entering a Permit-Required Confined Space, atmospheric testing shall be conducted by a trained person designated by the Confined Space Entry Supervisor. Authorized entrants and/or their authorized representative shall be provided with the opportunity to observe the pre-entry and subsequent testing or monitoring of the space. Testing equipment used in hazardous atmospheres shall be listed or approved for use in such areas by a nationally-recognized testing laboratory such as Underwriters Laboratories or Factory Mutual Systems. DES can assist individual departments in the selection of appropriate testing equipment.
- b) Instruments must be available to measure oxygen content, combustible/flammable limits and anticipated toxic contaminants. Testing equipment shall be accurate to the lowest concentration at which the contaminant becomes hazardous. Where technically feasible,

Hazardous Concentrations Present

If initial tests indicate the presence of hazardous concentrations of flammable vapors, workers shall **not** be allowed to enter the space until the space has been ventilated to eliminate the hazard. Where toxic substances or oxygen deficiencies exist, the space should be ventilated and/or sources of the hazard removed or controlled prior to entry.

Ventilation units must be carefully placed outside of a Confined Space to avoid drawing contaminated outside air into the space (e.g., engine exhaust is a ready source of carbon monoxide, a simple asphyxiant that is heavier than air and able to replace oxygen in a Confined Space.)

Where it is not possible to eliminate a toxicity or oxygen deprivation hazard, entrants must be equipped with air-supplied respiratory equipment and other applicable personal protective equipment. (Note: entrants must be trained in the proper use of personal protective equipment prior to its use. Entrants must also be included in the *University of Maryland Respiratory Protection Program*. Most entrants at UM,CP will not be allowed to enter Confined Spaces that require Self-Contained Breathing Apparatus (SCBA) or Supplied Air Respirators (SAR) use. If SCBA or SAR is required and provided for use, a separate respiratory protection training class will be provided.)

If ventilation is used to control a toxic or oxygen-deprivation hazard for the purpose of entry, entrants may be equipped with personal protective equipment to allow escape in the event of ventilation failure, such as an SCBA 5-minute escape respirator. (Note: SCBA training will be required for escape SCBA use.)

No Hazardous Concentrations Present

When tests do not indicate the existence of oxygen deficiencies, hazardous concentrations of flammable vapor, or toxic substances, the space may be entered and tests performed progressively throughout the space. If tests indicate the existence of hazardous atmospheres within the space, the tester must exit the space and proceed as described above.

Re-entry into a Permit-Required Confined Space

An entry team may exit and re-enter the Confined Space on the existing permit only if the following are completed prior to re-entry:

- a) Atmospheric testing shall be repeated and found within acceptable limits. If atmospheric tests are not within acceptable limits, precautions to protect entrants against the hazards shall be appended to the existing permit;
- b) The Confined Space Entry Supervisor shall verify that all safety precautions and other measures called for on the permit are still in effect;
- c) Only operations or work originally approved on the permit shall be conducted in the work place; and
- d) Only the original entrants may be admitted to the space specified on the original permit.

Temperature stress - Heat stress must be considered when evaluating the potential hazards associated with a Confined Space. Large scale communication equipment, computer equipment, steam lines or other equipment located in Confined Spaces may increase the ambient heat load of a Confined Space. Personal protective equipment worn by entrants to protect against another hazard may also increase the likelihood of heat stress by trapping body heat. The level of activity required by entrants, worker acclimatization to heat and individual physical condition will also affect potential for development of heat-related disorders.

Symptoms of heat stress include reddening of the skin, profuse sweating, fatigue and sometimes nausea. Entrants should exit the Confined Space, remove personal protective clothing and take cool liquids if symptoms of heat stress are experienced.

If not treated, heat stress can progress to heat exhaustion. Symptoms of heat exhaustion include moist and clammy skin, accompanied by a feeling of giddiness, fatigue, nausea, headache and a pale or mottled/flushed look. The next stage of heat stress is heat stroke in which the entrant's skin becomes hot and dry, with a mottled or bluish color. Mental confusion and a quickly-rising core body temperature will be noted. Heat stroke can be fatal without rapid medical attention. If symptoms of heat exhaustion or heat stroke are experienced by a member of the entry team, 9-1-1 must be contacted for assistance.

Personnel who must work in hot environments should exit the Confined Space at regular intervals for short rest breaks including water or an electrolyte replacement drink. Liquids should be cool but not cold. DES can assist entry teams in assessing the heat stress potential of a Confined Space prior to entry upon request.

COMMUNICATION

Confined Space entrants must be in constant communication with the attendant on duty. The attendant must be able to immediately contact 9-1-1. The attendant may communicate with 9-1-1 via radio as long as radio communication is monitored during the entire duration of the entry and immediate access to 9-1-1 is available.

If a Confined Space entry is made on UM,CP property, the Confined Space Entry Supervisor must notify the Department of Facilities Management Work Control of the time, date, location and purpose of the entry prior to entry. Work Control will identify other work being performed in the same location if applicable. Work Control may be reached by calling (301)405-2222.

MSDS Access

The University of Maryland Right-To-Know Program requires Material Safety Data Sheets (MSDSs) to be developed or obtained for hazardous chemicals used or stored on UM,CP property. Employees who are not familiar with MSDSs or the University of Maryland Right-To-Know Program should be registered for Right-To-Know training by calling DES at (301)405-3960. Training is required for all UM,CP personnel who do not work in a

All lighting and electrical equipment used inside of a Confined Space shall be properly insulated, grounded, approved for the use and in good repair.

Lockout/Tagout (LOTO)

Locking devices and tags shall be used when employees are performing maintenance or service on any machine or system where unexpected or unintentional release of energy or unexpected motion could cause harm or release a toxic material into a Confined Space. Sources of stored energy include electrically, chemically, pneumatically, thermally and/or hydraulically powered equipment or systems.

Locking devices and tags shall also be used when guards or other safety devices must be removed during service or when moving or energized parts put any part of the employee's body at risk of injury.

Examples of conditions where locking and tagging should be used may include but are not limited to:

- Clearing blocked or jammed mechanical equipment
- Maintenance or repair work on equipment with moving parts
- Repairing tanks with pipe feeds
- Steam line repair
- Repairs or installation of electrical equipment

More information about how to safely control hazardous energy can be found in the *University of Maryland Lockout/Tagout Plan*.

VENTILATION

Ventilation shall be maintained during Confined Space occupancy if there is potential for atmospheric conditions in the Confined Space to move out of acceptable ranges as defined in this program. (See "Acceptable Air Quality" under Atmospheric Testing.)

Ventilation shall not be used to control atmospheric contaminants in a Confined Space when the hazard can be eliminated by another means (e.g., through blanking or purging a system).

If ventilation is used to control a toxicity or oxygen deprivation hazard for the purpose of entry, entrants may be equipped with personal protective equipment to allow escape in the event of ventilation failure (e.g., an SCBA 5-minute escape respirator).

Exhaust ventilation equipment used in Confined Spaces shall be approved for use in potentially explosive atmospheres. Supply ventilation equipment (excluding ductwork) used in Confined Spaces shall be approved for use in potentially-explosive atmospheres if the mechanical components (fan, motor, etc.) are to be placed within the Confined Space. The source of air supplied to Confined Spaces must be derived from a location that is free from

Non-Permit Confined Space Entry

If a space does not require that a permit process be used, appropriate safety precautions to be determined by the Confined Space Coordinator must still be followed. Manholes and unvented utility vaults that contain telecommunications equipment shall be tested for combustible gas and, except when continuous forced ventilation is provided, the atmosphere shall also be tested for oxygen deficiency. When unsafe conditions are detected by testing or other means, the work area shall be ventilated and otherwise made safe before entry. Entry into these spaces with monitoring and/or ventilation does not require a permit procedure. However, if a hazard such as a chemical hazard, physical hazard or mechanical hazard cannot be eliminated, the Confined Space Permit process will be used.

Other spaces that have been reclassified from Permit-Required Spaces may also require ventilation and/or monitoring for safe entry, but may not require an attendant and full-body harness and life line. Communications equipment such as radios or cell phones are recommended for entry into non-permit spaces, especially when an attendant is not present.

Follow the instructions for "Atmospheric Testing" and "Ventilation" in the section on *Permit-Required Confined Space Entry* when monitoring or ventilating any confined space. The requirements for "Personal Protective Equipment", "Site Safety" and "Lockout/Tagout" must also be followed.

Specialized Work

Welding (29 CFR 1910.252): Minimum ventilation for welding requires: (1) a minimum of 2000 cubic feet per minute per welder as general ventilation, or (2) local exhaust ventilation (at the point of contaminant generation) of 100 feet per minute. Welding machines and compressed gas cylinders must be kept outside of the space. Electrodes must be removed from the holder when welders exit the space; welding gas and related fuel gases must be turned off from outside of the space. Where practical, torches, cables and hoses should be removed from the space when welding in not in progress. A hot work permit must be secured before any welding is done in any Permit-Required Confined Space. Hot work permits are available through DES website at http://des.umd.edu/hotworks.

	,	

Appendix I UM CONFINED SPACE ENTRY PERMIT

CONFINED SPACE ENTRY PERMIT

Instructions on back 🖼

University of Maryland, College Park

ration:			Type of Space:						
Reason for Entry									
Atmospheric Hazards: Oxygen deficiency Physical Hazards: Mechanical Electrical Hazard Controls: Ventilation Lockout/Tagout			□Combustible gas □Toxic contaminants □Chemical/Biological □Noise □Other □Personal Protective Equipment □Other						
Beginning	Beginning	A.M.	Ending			ı	ling		A.M.
Date:	Time:	P.M.	Date:			Tin	ne:		P.M.
	Authorized Personnel								
Entrants' Names w	ith Dept./Shop/ or Company	<u> </u>	Attendants' Names with Dept./Shop/ or Company						
ì									
	Re	quired I	Equipme	nt					
V	ethods with Entrants: □Vo				□Visua ⊐Radio	ıl □R □Oth	ope sign ner	als 🗆 C	Other
Personal Protective Equipment: □Coveralls □Tyvek® suit □Leather gloves □Chemical Resistant gloves □Welding gloves □Welding hood □Eye protection □Hearing protection □Respiratory protection □Safety shoes/boots □Hard Hat □Harness/life line □Tripod/winch □Other									
Traffic Control:	Barricades □Vests □Flags	s □Sign	s Hot w	orks: [JYes (Ho	ot Works	Permit	required)) □No
	At	mosphei	ic Testir	ng					
ype of Gas Monit				-	ast Calil	oration:			,
Tests	Acceptable Entry Conditions	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
Oxygen	19.5-23.5%								
Combustible Gas	Below 10% LEL								
Carbon Monoxide	0-25 ppm								
Initials	of Tester								
		Appr	ovals						
Entry Supervisor (P This Confined Spac	rint) nsibility of Entry Supervisor or rint) e Entry Permit has been revoke rint)	n (date)ed becaus	(Sig	n)	at (time)			
				,					

Appendix C - MSA Passport Combustible Gas Meter Instructions

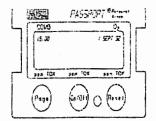


Figure 2-15. Time Display

Calibration Check

ACAUTION

The following calibration check should be performed before each day's use. This calibration check is very simple and should only take one to five minutes, depending on the number and type of gases your Passport Alarm is equipped to sense. Turn the Passport Alarm ON in clean fresh air, and verify that the readings indicate no gas present. If necessary, perform the procedure given in Fresh Air Setup Option later in this Chapter.

- Attach the pump module or calibration cap to the Passport Alarm, orienting the inlet fitting to point toward the battery pack.
- 2. Attach the calibration adapter (P/N 636246) to the calibration cap or pump module.
- Attach the regulator supplied with the calibration kit to the cylinder.
- 4. Connect the black tubing supplied with the calibration kit to the regulator.
- Open the valve on the regulator, and connect the other end of the tubing to the inlet filting.

The flow rate of the regulator is 0.25 lpm. Note the readings on the Passport display; they should be within the limits stated on the calibration cylinder or limits determined by your company. (If necessary, change cylinders to introduce other calibration gases.)

If the readings are not within these limits, the Passport Alarm requires recalibration. Return the instrument to your maintenance facility, or refer to the Passport Personal Alarm Technical Manual, Chapter 2, Calibration for detailed calibration instructions.

this calibration procedure applies to calibration gases available in cylinders. For those calibration gases only available in ampoules, refer to the Passport Personal Alarm Technical Manual, Chapter 2, Calibration.

Measuring Gas Concentrations

Combustible Gases (COMB)

The Passport Alarm detects combustible gases in the atmosphere. The Alarms sound when concentrations reach:

- · Alarm setpoint, or
- · 100% LEL (Lower Explosive Limit), or
- 5% CH4 (Methane by volume)

When the combustible gas indication reaches the Alarm Setpoint:

- Alarm sounds
- · Alarm lights flash;

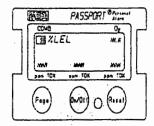


Figure 2-16. Combustible Gas Alarm Flag

- · Press the RESET button to silence the alarm.
- · Concentration of gas flashes in the display.

When the combustible gas indication reaches 100% LEL or 5% CH4 of the combustible gas:

- · Alarm sounds;
 - . This alarm cannot be reset with the RESET button.

The LockAlarm[™] circuit locks the combustible gas reading and alarm if the gas reading exceeds 100% LEL or 5% methane.

· OVER appears on the display.

The alarm can be reset by turning off the instrument and moving to a safe, fresh-air environment.

AWARNING

When the OVER alarm condition is reached, you are in a life-threatening situation; there is enough gas in the atmosphere for an explosion to occur.

You must:

- 1. Leave the area immediately.
- Turn OFF the instrument and do not turn it ON again until the instrument is in fresh air.

if you do not follow this procedure, you could be seriously injured or killed.

▲ CAUTION #1

Any Rapid up-scale reading followed by a declining or erratic reading may indicate a gas concentration beyond upper-scale limit, which may be hazardous.

A caution #2

High off-scale readings (indicated by "OVER") may indicate an explosive concentration. Only the combustible gas detection portion of this instrument has been assessed for performance.

Oxygen Measurements

The Passport Alarm detects the amount of oxygen in the atmosphere. There are two conditions which trigger the alarm:

- · Too little oxygen (deficient)
- · Too much oxygen (enriched)

At the Alarm Setpoint for either:

- Alarm sounds
- · Alarm light flashes
- · Concentration of gas flashes in the display

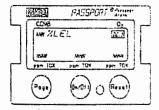


Figure 2-17. Oxygen Alarm Flag

A WARNING

When the OXYGEN alarm sounds, you may be in a life-threatening situation.

You must follow your company's work and safety procedures. If you do not follow those procedures you could be seriously injured or killed.

Toxic Gas Measurement

The Passport Alarm detects certain toxic gases in the almosphere. Your instrument may have one, two, or three toxic sensors. Each of these sensors has a setpoint which causes an alarm if the gas level goes above that setpoint. When this happens:

- Alarm sounds
- Alarm lights flash
- · Concentration of gas flashes in the display

AWARNING

When the TOXIC GAS alarm sounds, you may be in a life-threatening situation.

You must follow your company's work and safety procedures. If you do not follow those procedures you could be seriously injured or killed.